Evaluating the Accessibility of the Manitoban Construction Industry to Physically Disabled Construction Workers and its Relation to Safety Performance

Final Report Submitted to:
Research and Workplace Innovation Program
Workers Compensation Board of Manitoba

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Abstract

Despite the potential benefits of DM programs in reducing costs and improving workplace morale, many organizations in the construction industry appear unable to develop and implement them. Inadequate support and practices at the organizational level affect the degree to which construction workplaces can accommodate disabled workers returning to the workplace with a disability, reinforcing the need to investigate the maturity of existing support and practices. Moreover, there's little empirical evidence in the literature about the disability management performance of the construction industry in general.

The research aimed to investigate disability management in the Manitoban construction industry and its relation to safety performance. Specific objectives involved developing and validating a model to evaluate the maturity of construction organizations' disability management practices, and a set of metrics to evaluate their disability management and safety performance. The research also aimed to evaluate the relationship between the maturity of construction organizations' disability management practices, their disability management performance and their safety performance. The research made use of maturity modelling to develop the required model. The developed model, called the Construction Disability Management Maturity Model, benchmarked construction companies' disability management performance using 12 disability management indicators. The weights of importance of these indicators was determined by eight construction experts using an analytical hierarchy process. The model was then applied to a sample of 10 general contractors in Manitoba using an assessment worksheet. The research also involved developing three safety metrics and 13 new disability management metrics and using them to evaluate the safety and disability management performance of the same general contracting companies. The maturity

model results were correlated to the disability management and safety performance metric results to investigate the relationship between construction organizations' disability management maturity and their disability management and safety performance.

The results showed "Return to Work" and "Disability and Injury Management" practices were the most important disability management indicators whereas "Physical Accessibility" and "Claims Management" practices were the least important. The results also showed that the ten construction companies operated at the quantitatively managed maturity level. The findings revealed that smaller-sized companies were more mature on average with respect to disability management than larger companies. "Senior Management Support" and "Disability and Injury Prevention" were found to be the most mature disability management indicators while "Retention and Recruitment" and "Communication" practices were the least mature. The findings also showed that companies with higher disability management maturity tended to record lower recordable injury rates, lower severity rates and lower lost time case rates, and thus have higher safety performance than companies with lower disability management maturity. Nevertheless, the relationships between various indicators of disability management performance and various indicators of safety performance were not statistically significant for the most part, most probably because of the small number of companies evaluated. This research delivered leading indicators of performance in the form of the Construction Disability Management Maturity Model that construction organizations can use to evaluate, benchmark and improve expected disability management performance. It also delivered lagging indicators of performance in the form of new metrics that they can use to evaluate, benchmark and improve actual disability management performance.

Acknowledgments

This research was supported by a grant from the Research and Workplace Innovation Program of the Workers Compensation Board of Manitoba.

The authors would like to take this opportunity to express their special gratitude to Mr. Bruce Cielen and Ms. Joanne Machado from the Workers Compensation Board of Manitoba for their continuous guidance and support throughout this research. The authors are also very grateful to Mr. Greg Messer from the Workers Compensation Board of Manitoba and to Mrs. Carol Paul from the Manitoba Construction Sector Council for their support throughout the data collection phase of the research. The authors would also like to acknowledge the academic support given by members of the University of Manitoba's Construction Engineering and Management group.

There were a number of individuals and organizations who contributed to the success of the research. The authors would like to thank Mr. Jimmy Winter for leading the work related to the first research objective and Mr. Brenden Chastko and Mr. Xue Yipeng for their assistance throughout their summer internships. They would also like to thank Dr. Nancy Hansen from the University of Manitoba Department of Disability Studies for her valuable insights into the development of the research methods. The authors would also like to acknowledge the significant contribution and active involvement of the participating companies and construction experts though they may not be mentioned to ensure their confidentiality. The authors are also grateful to the Construction Safety Association of Manitoba for its help during the data collection phase and to the University of Manitoba Research Ethics Board for its review and approval of the research methods.

Disclaimer

This research generated the following conference and journal publications. These publications were reviewed and approved by the Workers Compensation Board of Manitoba and were also appended to the previous progress reports submitted to them.

1. Quaigrain R. and Issa, M. (2016) Validation of the Construction Disability Management Maturity Model using Analytical Hierarchy Process, RICS COBRA Conference, Toronto, Canada

2. Quaigrain R. and Issa, M. (2016) Development of Metrics to Evaluate Disability Management and Safety Performance in the Construction Industry, Resilient Infrastructure Conference, Canadian Society for Civil Engineering (CSCE), London, Ontario

3. Quaigrain R. and Issa, M. (2015) A Model to Evaluate the Maturity of Construction Organizations' Disability Management Practices, 5th International/11th Construction Specialty Conference, Vancouver, British Columbia.

4. Winter, J., Issa, M. H., Quaigrain, R. A., Dick, K. and Regehr, J. D. (2015) "Evaluating Disability Management in the Manitoban Construction Industry for Injured Workers Returning to the Workplace with a Disability", Canadian Journal of Civil Engineering Vol. (10.1139/cjce-2015-0114)

5. Quaigrain, R., and Issa, M. H. (2014). "A Critical Review of the Literature on Disability Management in the Construction Industry", 30th ARCOM Annual Conference, Portsmouth, UK

This final report draws heavily on those publications. Individual reports have also been submitted to each of the companies that took part in the research. An anonymous sample report is attached to appendix K.

More conference and journal publications in addition to a student's thesis may be generated from this research subject to their review and approval by the Workers Compensation Board of Manitoba.

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List of Acronyms & Abbreviations

AHP	Analytical Hierarchy Process
CEM	Construction Engineering and Management
CDM3	Construction Disability Management Maturity Model
CLP	Claims Management Practices
CMM	Capability Maturity Model
CMMI	Capability Maturity Model Integration
CMP	Case Management Practices
CP	Communication Practices
CSAM	Construction Safety Association of Manitoba
DIP	Disability and Injury prevention practices
DM	Disability Management
EP	Ergonomic practices
LTCR	Lost Time Case Rates
MS	Maturity Score
OECD	Organization for Economic Cooperation and Development
PAP	Physical Accessibility Management Practices
PEP	Program Evaluation Practices
PG	Potential Growth
RAP	Return to Work and Accommodation Practices
RCP	Regulatory and Compliance Policies
RIR	Recordable Injury Rates
RRP	Recruitment and Retention Policies
RTW	Return to Work
SMP	Senior Management and Leadership Support Practices
SPICE	Standardized Process Improvement for Construction Enterprises
SR	Severity Rates
TPM	Transitional Program Management Practices
UK	United Kingdom
UN	United Nations
UPIAS	Union of Physically Impaired Against Segregation
WCA	Winnipeg Construction Association
WCB	Worker's Compensation Board
WHO	World Health Organization

CHAPTER 1: INTRODUCTION

This chapter provides the reader with background information about the research focusing in particular on the concepts of construction health and safety and disability. The chapter defines the problem that the research addresses. It also identifies the research goal, objectives and scope and reflects on its originality and significance to both industry and academia.

1.1 Construction Health and Safety

The construction industry has traditionally had a poor safety record. A review of the literature shows that in certain industrialized nations, the industry has a fatal and major injury rate that is three times higher than that of all other industries (Clarke et al. 2009). Lingard & Saunders (2004) found that only 57% of construction workers reached the age of 65 without suffering a permanent impairment. Clarke et al. (2009) estimated the rate of unreported accidents at 50% and found that 62% of construction workplaces had unsafe conditions and 46% of the construction workforce had the training required to do their jobs.

In Canada, the construction industry was responsible for 27,577 time-loss injuries in 2012, representing the third highest number of time-loss injuries behind the health and social service and manufacturing industries for that year (Association of Workers' Compensation Boards of Canada 2013). It was responsible for a total of 211 fatalities in 2012, representing 21.6% of all fatalities alone: the highest rate of any industry in the country.

In Manitoba, the construction industry was responsible in 2012 for 2,082 time-loss injuries and

also had the third highest rate of time-loss injuries in 2012. Six fatalities related to the construction industry were reported in 2012. These represented 16.7% of all fatalities in Manitoba: the second highest rate behind government services in 2012 (Association of Workers' Compensation Board of Canada 2013). This is despite the construction industry representing only 7.2% of the total workforce in Manitoba in 2012. Despite a decrease in time loss injury rates from 11% and 7.5% in 2000 to 6.7% and 5.1% in 2011 for heavy and building construction respectively, these rates were still much higher than the overall average rate of 3.3% in 2012. Building and heavy construction's all injury rates were also a lot higher than the provincial averages equalling 14.5 and 10.3% respectively.

1.2 Disability

Until recently, the dominant paradigm regarding disability was the deficit model, one variation of which is the medical model (Pfeiffer 2001). The medical model contends that disability is a physical or mental impairment limiting one or more life activities. The medical model assumes that disability is linked to the individual and due to genetics or environmental conditions such as illnesses, accidents, war and pollution (Barnes 1999, Pfeiffer 2001). The model is primarily concerned with the avoidance, detection, categorization and elimination of impairment, and with rehabilitating people through medical and psychological treatment. Highly contested is the notion of disability as an individual problem, as evidenced by the experiences of people with disabilities (Asch and Fine 1988, Barton 1988, Fleischer and Zames 2001, Oliver 1983, Pfeiffer 1992:1998; Priestley 1999, Sapey and Hewitt 1991).

While most research relies on the medical model of disability (Barnes 1991, Oliver 1997), the

stigma model is still used sometimes and focuses on the perceptions, attitudes and biases related to disabled people in the workplace. The stigma model is based on Goffman's (1963) definition of disability as a social stigma because of disabled people's inability to meet the norms of society. But whereas Goffman (1963) was concerned with how disabled people interact with their social surroundings, diversity management research based on the stigma model is primarily concerned with how disabled people are perceived and treated (Thanem 2008). Although research (e.g. McFarlin et al. 1991, Thanem 2008, Stone and Colella 2006) based on the stigma and medical models acknowledge the discrimination faced by disabled people in the workplace, it attributes it to the functional limitations of these people.

Another model, the social model stands in direct contrast with the medical model. The model originated from the Union of the Physically Impaired against Segregation in the 1970s in the United Kingdom (Campbell and Oliver 1996), and was later formalised by Oliver (1983), Corker (2000) and Finkelstein (1980). The social model views "society's failure to provide appropriate services and adequately ensure the needs of disabled people" as the main problem rather than disabled people's functional limitations as viewed by the medical model (Oliver 1996). It explains disability in social terms focusing on the ways in which the physical, cultural and social environments exclude or disadvantage disabled people (Pfeiffer 2001), making this a human rights issue related to equality and aligning disabled people with other oppressed groups.

Feminist and phenomenological approaches argue that disability is not just in the external social world (Thomas 2004) but also in people's embodied experience of impairment: an aspect usually overlooked by the social model. Crow (1996) argues that disabled people are "frustrated and

disenchanted by pain, fatigue, depression and chronic illness", criticizing the social model for its focus on socio-political and institutional issues and its neglect of personal issues.

Recent years have witnessed a move to apply the theory of social constructionism to disability (Borden 1992, Brzuzy 1997, Ringma and Brown 1991). Witkin (1990) described constructionism as a theory that seeks to "elucidate the socio-historical context and ongoing social dynamic of descriptions, explanations, and accountings of reality". Implicit in social constructionism is the idea that knowledge is not an objective entity or reality but is rather a social creation (Levine 1997). According to Hiranandani (2005), social constructionism offers significant insight to disability because most individualistic, accounts of disability fail to recognize that even the most objective of disorders, such as visual impairment, vary across cultures and societies. For instance, Edgerton (1985) showed that attitudes towards people with impairments in non-western cultures ranged from negative discrimination, to acceptance and even positive attribution of supernatural powers. In many cultures, one cannot be "disabled" because "disability" as a term does not exist in other languages (Ingstad and Reynolds-Whyte 1995). This understanding of disability as a social and cultural phenomenon, rather than an inherent objective reality calls into question the assumptions made by the medical model and that form the foundation of disability research and practice (Hiranandani 2005).

Another approach: the emancipatory paradigm was put forward by Oliver (1992), Barnes (1992) and Finkelstein (1992) to provide an alternative to the non-partisan, objective research model long accused of having compounded disabled people's oppression (Barnes 1996, Stone and Priestley 1996). The critical theory or emancipatory paradigm emphasizes emancipatory goals and commits

to open partisan support and empowerment of research subjects (Oliver 1997, Barnes 2003). This is because of the traditional asymmetrical relationship between researchers and research subjects that alienates disabled people from the research process (Oliver 1997). Not only does the paradigm aim to change the relationship between researchers and research subjects, it also aims to change the role of funding bodies and the relationship between research findings and policy responses (Oliver 1997, Barnes 2003).

1.3 Goal and Objectives

Inadequate support and practices at the organizational and managerial levels affect the degree to which construction workplaces can accommodate disabled workers returning to the workplace with a disability, reinforcing the need to investigate the maturity of existing support and practices. Moreover, there's little empirical evidence about the maturity of these practices and the status of disability management (DM) in construction in general. Therefore, this research aimed to investigate DM in the Manitoban construction industry and its relation to safety performance. Specific objectives involved:

1. Evaluating the status of DM in the Manitoban construction industry
2. Developing and validating DM indicators that can be used to evaluate construction organizations' DM performance
3. Developing and implementing a model to evaluate the maturity of construction organizations' DM practices
4. Developing and implementing metrics to evaluate construction organizations' DM and safety performance
5. Evaluate the relationship between the maturity of construction organizations' DM

practices, their DM performance and their safety performance

6. Making recommendations to improve the maturity of construction organizations' DM practices

1.4 Scope

The research focused on evaluating the status of DM in the Manitoban construction industry in particular. It also focused on developing and applying the model and metrics and evaluating the relationship between them within the local Manitoban industry. The model centers on evaluating DM at the organizational level rather than at the industry or project level. It aims to investigate the extent to which an organization's existing DM policies and practices compare against DM best practices. The metrics also aim to evaluate safety and DM performance at the organizational level. The research does not address specific physical retrofits or assistive technologies aimed at making workplaces more accessible. It also does not restrict itself to one type of physical or mental disability. The research focuses on evaluating general contractors' organizations in particular. The tools developed evaluate DM using leading and lagging indicators of performance and using qualitative and quantitative measures respectively.

1.5 Significance and Originality

This research provides a tool that construction organizations can use to evaluate the maturity level of their existing disability management (DM) practices. The research measures DM using leading and lagging indicators of performance. Leading indicators encompass aspects that assess the existing organizational policies and practices and forecast how well a company is expected to

perform with respect to DM. Lagging indicators will involve the development of quantitative objective metrics that measure actual DM and safety performance. The research also delivers a set of DM best practices that construction organizations should aim for. The developed tool will evaluate construction organizations' existing policies and practices against these best practices. It will also aim to identify deficiencies in them and areas in need of improvement so that they can be addressed. Construction organizations should be able to use the tool on a regular basis to assess their performance and address issues as they arise. The tool can be modified in the future to reflect changing legislation and enable the evaluation of changing best practices. It's also a tool that organizations will be able to modify to suit their specific work environment and requirements. It can be used not only by construction companies but also by the Worker's Compensation Board of Manitoba, the Construction Safety Association of Manitoba and other regulatory bodies for auditing purposes. Should these best practices be mandated and enforced, the tool could be used in a regulatory capacity to evaluate compliance with them.

This research is expected to enable a better understanding of the relationship between improved DM practices and improved safety performance. Should a relationship exist, the research would be making the case for the need to better integrate disabled workers in the workplace to ultimately improve everyone's safety. Employers who are serious about health and safety would therefore need to show that DM is a priority, that due diligence is exercised and that policies and practices in place remain are in accordance or exceed existing standards. The research could help justify further investments in DM to ensure related practices effectively accommodate disabled workers on site and in the field. It could also help make the case for the need to improve existing guidance (e.g. Workplace Accessibility Act) and their enforcement to ensure greater accessibility to all.

CHAPTER 2: LITERATURE REVIEW

This chapter provides a detailed review of the relevant literature in the field. More specifically, this chapter includes a discussion of the concept of Disability Management (DM) and its theoretical foundations. A review of the history and origins of the concept as it pertains to Canada specifically is also reviewed. This is followed by a review of the literature on DM in relation to the construction industry specifically. The chapter also describes the theoretical foundation of the concept of maturity modelling as well as its history, origins and application to the construction industry. Methods used to benchmark construction safety and DM performance, in particular the use of metrics are finally discussed as part of this chapter.

2.1 Disability Management

This section provides an overview of the history and origins of DM and its theoretical underpinnings in general and as it relates to Canada in particular. It also provides a review of the literature on disability and DM as it pertains to the construction industry specifically.

2.1.1 Disability Management: Theoretical Foundations

Disability management (DM) first arose in Finland in the 1970s, but did not gain prominence until the 1980s in the United States as an approach that can be used by large employers to reduce their workers' compensation costs and rising health care costs (Tate et al. 1989, Schwartz et al. 1989, Dyck 2006, Hunt 2009). DM as a concept was conceived by employers to control disability costs beginning in the mid-1980's (Galvin et al. 1986). The concept built on older vocational

rehabilitation programs for injured workers and gradually evolved to incorporate the return to work (RTW) model. As regulations became more stringent, aspects such as safety, ergonomics, ecological assessment and specialized case management strategies were integrated to it (Hursh 1997, Rosenthal et al. 2005). It found its way into workers' compensation public policy in the 1990s. Although DM as a concept did not reach Canada until the 1990's, the movement to recognize people with disabilities in Canada began in the 1980's (Westmorland and Buys 2004). Over time, the service-based approach evolved into a workplace-based approach and took into account aspects such as organizational development, safety, risk management, and case management (Rosenthal et al. 2007). These aspects became the foundations of DM policies and programs. The concept gradually evolved from a cost controlling approach to an employer-based one that aims to prevent and manage injury considering aspects such as organizational development, safety, risk management, and case management (Rosenthal et al. 2007).

DM can be defined as a workplace prevention and remediation strategy that seeks to prevent disability from occurring (Hursh 1997). Lacking that, it aims to intervene following the onset of a disability to ensure the continued employment of those experiencing functional work limitations (Akabas et al. 1992, Rosenthal et al. 2007). According to Tate et al. (1986) and Smith (1997), DM is a cohesive, systematic, and goal-oriented process that involves: (a) minimizing the impact that limited capacities may have on an individual's social and vocational roles and (b) maximizing his or her health to prevent disability or further deterioration if a disability is present. It incorporates three key domains: prevention, early intervention and proactive RTW interventions to reduce the impact of injury and disability and accommodate those experiencing functional work limitations. The sphere of DM encompasses a wide range of other interventions such as claims management,

benefits management as well as vocational and industrial rehabilitation (Angeloni 2013).

Current models of DM incorporate elements of the systems theory, whereby employees' disabilities are seen as impacting the health and functional integrity of the whole organization (Rogers 1993). They also diminish the organization's productivity and economic performance (Rogers 1993). An extension of the systems approach is the notion that employees are not just "hued hands" but full members of the organization who contribute to achieving the organization's goals. This is an important premise that underpins every effective DM program (Cowan 1995, Galvin 1986, Shamie 1994, Tate et al. 1986). This is because disability does not only implicate the individual worker but also co-workers and supervisors who take on increased workloads to compensate for the absent worker (Smith 1997). As shown in Figure 1 (Rondinelli et al. 1997), an employee who sustains an on the-job injury typically receives an initial medical assessment by an approved provider, more often a general practitioner who lacks formal occupational training. This practitioner must decide whether to authorize the employee's return to work, and whether to refer him or her to a physiatrist or other medical, therapeutic, and educational care before revaluation. This would be followed by the development and customization of a RTW strategy for the employee by the employer.

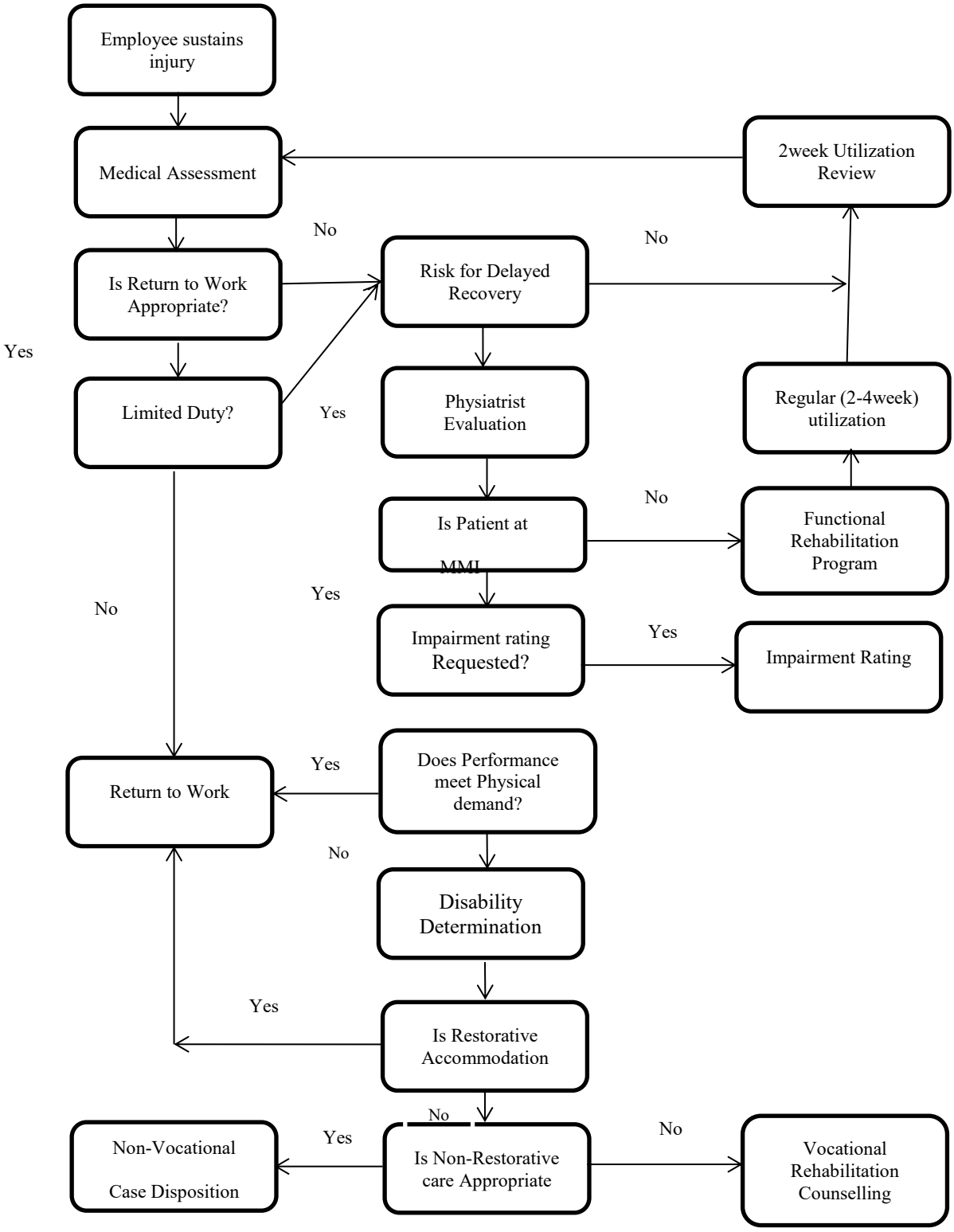

Figure 1: Generic Rehabilitation Process for Injured Workers (Rondinelli et al. 1997)

According to Rieth et al. (1995), DM involves three levels of disability prevention: 1) primary prevention intended to prevent on-the-job and off-the-job disabilities, 2) secondary prevention intended to minimize the impact and cost of disabilities, and 3) tertiary prevention, intended to encourage rehabilitation and RTW. In practice, most firms concentrate on tertiary prevention, only intervening once an injury has occurred. Tertiary intervention limits the effectiveness of DM because it limits the practices that can be implemented at this stage and related cost savings, thus the reluctance of many firms to adopt formal DM practices. These practices should not only protect from work hazards but also promote improvements in personal health behaviours: an aspect often overlooked in tertiary prevention, thus the importance of proactive primary and secondary prevention (Angeloni 2013).

Although prevention is the best way to protect employees and control costs, workplaces need a way to manage resources and assist employees should injuries or illnesses occur (Shamie 1994, Tate et al. 1986). A comprehensive DM program should enable prevention and early intervention, and help alleviate many of the concerns experienced by injured or ill employees. According to La Torre et al. (2009), effective DM includes "injury prevention and safety programs, health promotion and wellness programs, early intervention and RTW plans, benefit programs design, internal and external communication system, education, worksite accommodations, transition work options, and identification of key worksite personnel". According to Lingard and Saunders (2004), firms pursue DM in response to the globalization of their activities, the growing multiculturalism of their workforce and as a competitive necessity.

The success of DM programs is measured in terms of cost efficiency, administrative efficiency,

and reduced complexity of the claim and benefit systems (Angeloni 2013). The advantages of implementing them include improved employee health and safety and improved employee morale and satisfaction (Calkins et al. 2000, Harder et al. 2006). Companies that implement DM programs should benefit not only from savings in direct costs but also in indirect costs. Indirect cost savings include lower disability insurance premiums due to a reduction in overall disability claims (Hargrave et al. 2008, Kuhnen et al. 2009). Comprehensive DM programs that take into account the physical and organizational work environment as well as the personal health of individuals are more effective than those that consider each separately (Angeloni 2013).

2.1.2 Disability Management in Canada

Despite its late start, Canada witnessed tremendous progress with respect to DM. A key milestone involved the establishment of the Canadian National Institute for Disability Management and Research (NIDMAR) in October 1994 in British Columbia with the aim of facilitating the implementation of workplace-based reintegration programs. This was done using a consensus-based approach through activities such as education and training programs, as well as research and policy development. The institute expanded internationally through partnering with local people in other countries (Tate et al. 1989, Schwartz et al. 1989, Shrey and Hursh 1999, Hunt 2009), helping enact relevant guidance in those countries. For example, the International Labour Organization (ILO) in Geneva adopted the ILO Code of Practice on Managing Disability in the Workplace in 2002 based on the foundation provided by NIDMAR, with international research and development contributions from Australia, Europe, New Zealand, and the United States (Hunt 2009). Within Canada, the NIDMAR program's standards were also adopted in whole or in part by workers compensation boards (WCB) in Newfoundland and Labrador, Ontario and

Saskatchewan in 2004, 2005 and 2006 respectively. The WCB of Manitoba also adopted the Consensus Based Disability Management Audit tool developed by NIDMAR to evaluate, monitor and improve organizations' DM performance (Hunt 2009).

DM is often discussed in relation to Return to work (RTW), which is an essential component and desired outcome of DM. Young et al. (2005) presented return to work (RTW) as an evolving process, comprising four key phases: off work, work re-entry, work retention, and work advancement. The authors deemed a RTW intervention successful if it could help workers remain employed, decrease work absence, or help workers return to productivity. Franche et al. (2005) found senior management support to be an important determinant of RTW interventions given the likelihood for friction and the need for collaborative problem solving when implementing them (Hunt & Habeck 1999, Main and Shaw 2016, White 2011). Strunin and Boden (2000) classified employer responses to RTW as one of three: "welcome back", "business as usual" and "you're out". In the first response, employers encouraged workers' return to pre-injury employment and provided accommodations to enable this return. In the second and third responses, employers showed some neglect of workers' needs or found reasons to terminate their employment. Bruyere and Shrey (1991) suggested active collaboration between disability managers and union representatives and recommended: 1) including explicit contract language with respect to RTW, 2) increasing awareness of disability within the workforce, 3) developing accommodation and RTW plans that have organizational support, and 4) developing data monitoring systems that facilitate alternative RTW placements, track injuries and illnesses, and maintain job analysis profiles (White 2011). Franche et al. (2005) found that the provision of workplace accommodations and regular contact between healthcare providers and the workplace significantly

reduced time away from work. Other factors reducing time away from work included early contact between the workplace and the worker, the presence of a RTW coordinator and ergonomic work site visits by him or her (Shrey and Lacerte 1995).

2.1.3 Disability Management in Construction

Historically, disabled persons were discriminated against in various forms: from extinction and euthanasia to banishment and segregation, fueling prejudice against them and systematic under-representation in key areas of society (Tshobotlwane 2005). This also restricted their access to employment; resulting in widespread poverty and illness (Schwellnus 2002, Swartz, 2004). The challenge to the construction industry is that of allowing people with disabilities to play meaningful roles. Unfortunately, the legacies of Social Darwinism and eugenics, which discriminated against disabled people, still persist today in many countries (Napier 2002). Disabled people continue to experience many barriers, including the negative attitudes of employers and other employees, inadequate workplace accommodations and discriminatory recruitment and employment practices (Lagadien 1996, Dench 1996, Meager 1996).

The medical model is the most used disability model in the construction industry (Brzuzy 1997, Finkelstein 1991). The model views disability as a functional limitation, an individual problem, pathology, dysfunction, or deviance. The perpetuating image of the construction industry as one with harsh physical conditions that are not suited to disabled people is constantly put forward (Tshobotlwane 2005). Eppenberger and Haupt (2003) argue that construction workers are confronted with dangerous, life-threatening work conditions on a daily basis, leading to serious accidents and injuries. There is also little understanding of the design requirements needed to

accommodate disabled people because the main stakeholders are not involved in the building process (Clarke et al. 2009).

Research on DM in construction is still in its early stages, with very few journal papers published on the topic. A study by Clarke et al. (2009) analyzed the British and Dutch approaches to DM in the construction industry and found the Dutch model to be more skewed to the social model whereas the British one was considerably more regulated. The authors found the construction industry in both countries to be highly disabling and exclusive. The nature of the industry is such that many construction workers do not have a long-term relationship with their employers, compounding the unwillingness of employers to accommodate them should they get injured (Welch et al. 1999, Lingard and Saunders 2004). Small construction firms are also less able to accommodate injured workers than larger ones because they are less likely to have the resources to do so, making workers in small firms more likely to suffer if injured than workers in larger ones (Kenny 1999, Lingard and Saunders 2004, Cheadle et al. 1994). Many employers believe that people with disabilities do not have a place in the construction industry (Newton and Ormerod 2005, Tshobotlwane 2005), with new entrants facing more challenges than returning ones. This is because employers are less likely to hire people with disabilities than to take back ones disabled because of an injury on the job (Newton and Ormerod 2005).

The review also shows little to no formal practices in place to support construction workers with disabilities and that employers are ready to comply with existing legislation only when adjustments to do so are minor and inexpensive (Tshobotwane 2005, Newton and Omerod 2005). Construction employers are also less likely to have such policies and practices than employers in other industries

(Newton and Ormerod 2005). Tshoboltwane's (2005) survey of employers and workers with disabilities in the South African construction industry found the majority of employers ignorant of the Employment Equity Act Provisions. Employers who had complied with the act found the cost to do so negligible. This is in contrast to employers surveyed by Lingard and Saunders (2004) who believed that DM practices increased operating costs but provided little to no return in terms of reducing lost workdays. They were reluctant to adopt formal rehabilitation and RTW programs because of the difficulty with providing suitable alternate work for disabled workers. Lingard and Saunders (2004) found that construction injuries usually led to long-term disability: a disturbing fact given the lack of formal polices in place to prevent this. Jobs for workers with disabilities automatically excluded by employers included "ladder climbing, walking on rough ground, tunneling, working at height, working in confined spaces, working on the railways" (Newton and Omerod 2005). Smallwood and Haupt (2008) found physically impaired workers more suited to administrative work.

A later study by Omerod and Newton (2013) used interviews and mini focus groups to investigate barriers to the employment of young people with disabilities in the UK construction industry. The study revealed the need for an inclusive approach that would treat workers with disabilities equally rather than favourably. The industry including both employers and professional institutions also needed to raise awareness on the range of opportunities available for young workers with disabilities to dispel the myths that construction work is only for able-bodied, fit men. Smallwood and Haupt (2008) recommended that governments provide incentives to encourage the employment of workers with disabilities.

2.2 Maturity Modelling

This section discusses the concept of maturity modelling: its history, origins and its application within the construction in particular.

2.2.1 Maturity Modelling: Theoretical Foundations

Maturity modeling emanated from the software manufacturing industry (Finnemore et al. 2000) in response to the poor performance of software manufacturers working on US Department of Defense Projects (Paulk et al. 1995). It is based on the earlier concepts of process improvements such as Philip Crosby's quality management maturity grid describing "five evolutionary stages in adopting quality practices" (Crosby 1979) and the Shewhart plan-do-check-act cycle (Paulk et al. 1995). Process maturity modeling consists of various stages of progression which, when adhered to increases the effectiveness of a process. One of the earlier models is the Capability Maturity Model (CMM) developed by researchers at Carnegie Mellon University (Paulk et al. 1995). CMM uses the original framework of maturity modeling and defines five thresholds or levels of maturity for a given process (Paulk et al. 1995). At the first level, a process is primarily chaotic or ad-hoc. It is made repeatable at the second level, after which it becomes defined or standardized. At the fourth level, a process is usually measured or controlled, before it is optimized at its highest level by subjecting it to continuous improvement and feedback cycles.

Assessing the maturity of a process involves investigating the degree to which the process is defined, managed, measured and controlled (Dorfman and Thayer 1997). This is usually accomplished by analyzing the policies and practices existing within the process (Paulk et al. 1995). Process maturity modelling was found to reduce the overall software development cycle in

the field of software development (Harter et al. 2000) and improve project performance in the field of project management (Ibbs and Kwak 2000). It also improved the forecasting and meeting of goals, costs and performance (Lockamy and McCormack 2004).

2.2.2 Maturity Modelling in Construction

In construction, the concept has been applied to develop a number of maturity models. The Standardized Process Improvement for Construction Enterprises Model (SPICE) (Sarshar et al. 1998) was developed by researchers at Salford University to improve the management of construction processes, as called for in the Latham report on the performance of the UK construction industry (Sharshar et al. 1998). The model consists of five maturity levels. It involves testing an organization's key processes against five process enablers (Finnemore et al. 2000). Finnemore et al. (2000) and Amaratunga et al. (2002) found its assessment to be based on facts rather than perceptions. They also found that the model identified process strengths as well as weaknesses, and enabled the development of improvement and implementation plans. Nevertheless, the model does not account for the multi-organizational nature of construction work (Vaidyanathan and Howell 2007). The Construction Supply Chain Maturity Model (CSCMM) aims to remove inefficiencies in the construction supply chain and improve operational excellence (Vaidyanathan and Howell 2007). It does so along three dimensions: functional, project and firm. It is based on the concept of process maturity as used in the CMM and consists of four levels of maturity. Although the model addresses the multi-enterprise supply chain aspect of construction, it does not take into account other aspects such as building information modelling. The Construction Industry Macro Maturity Model (Willis and Rankin 2011) is based on an adaptation of the concept of process improvement used in the CMM. It assesses the maturity of the

construction industry at the macro level, providing leading indicators of project performance. There are three possible maturity levels associated with each key practice, with the evaluation based on the presence of specific outcomes or indicators. While the model may be appropriate for use at the macro level given the characteristics of the industry, it is inadequate for use at the organizational level given it's over simplification of the growth process at that level (Willis and Rankin 2011).

A number of maturity models have been developed for project management specifically, with the Project Management Maturity Model (PM3) being the most notable of all (PMI 2005). The PM3 includes a "directory of best practices", which lists over 500 organizational project management best practices. It assesses organizational project management maturity along three domains, i.e. project, portfolio and program and four stages of process improvement. Despite its strengths, the model does not use a hierarchical scale or levels of maturity, which makes quantifying organizational project management maturity difficult. Another model: the Fuzzy Industry Maturity Grid (FIMG) is mostly used at the macro level. The FIMG is a modification of the Industry Maturity Grid (IMG), first developed by University of Cambridge as "a qualitative model offering diagnostic and prescriptive analysis of a subject industry" (Tay and Low 1994). The IMG operates under three dimensions: markets, technologies and structures, with each having its own set of characteristics. Weakness of the IMG according to Tay and Low (1994) is that an industry is assumed to belong to one of only eight possible sub-cubes. There also appears to be a disconnect between maturity and performance, since unlike other maturity models, the FIMG does not presume a relationship between improved maturity and improved performance. Only one model has so far been developed for health and safety in construction: the Health and safety Maturity

Model (Goggin and Rankin 2009). The model assesses maturity based on six key safety factors and three maturity levels. However, it does not adequately cover DM aspects such as injury management and prevention.

2.3 Benchmarking Safety Performance

The risk of a fatality in the construction industry is five times higher than in the manufacturing industry, whereas the risk of a major injury is two and a half times higher (Sawacha et al. 1999, Davis and Tomasin 1990). Most research has focused on safety performance evaluation as an essential part of safety management, since it provides information on the system's quality in terms of development, implementation and results (Sgourou et al. 2010). For instance, a study by Sawacha et al. (1999) investigated the impact of historical, economical, psychological, technical, procedural and organizational factors as well as the working environment on construction safety performance. The study found an organization's policy towards safety to be the most influential factor driving safety performance. This reinforces the need for safety performance evaluation frameworks that help companies identify potential hazards at an early stage (Ng et al. 2005, Crocker 1995). Ng et al. (2005) proposed a safety performance evaluation framework that is more comprehensive, structured, and organized than previous frameworks (e.g. Mohamed 1999) and that relies on the administration of two questionnaires to evaluate seven main factors and six related sub-factors. Also, Mahmoudi et al. (2014) proposed a framework for the continuous monitoring and improvement of construction companies' safety. The framework evaluates seven main factors and 120 related sub-factors. Similarly, Teo and Ling (2006) developed a model to measure the effectiveness of construction safety management systems using a safety index.

Safety performance has also been traditionally measured using metrics (Hinze et al. 2013, Sgourou et al. 2010), such as the recordable injury rate, days away, the transfer injury rate or the experience modification rating on workers' compensation (Ng et al. 2005, Hinze et al. 2013, Grabowski et al. 2007). Additional metrics used include the number of injuries and their severity as well as accidents' frequency and related costs (Sgourou et al. 2010). Metrics used less regularly include the loss ratio (i.e. the ratio of the cost of claims to the cost of premiums) and the number of liability claims related to worksite injuries (Hinze et al. 2013). Given that these metrics provide historical information about past safety performance, they are known as lagging indicators of performance (Hinze et al. 2013, Toellner 2001). The distinction between leading and lagging performance indicators is not always clear-cut (Reiman and Pietikäinen 2012), with some researchers describing them as a continuum rather than two separate entities (Hopkins 2009, Hale 2009, Wreathall 2009). Typically, leading and lagging indicators are considered on a time scale where leading indicators precede harm and lagging indicators follow it. Leading indicators are considered superior to lagging indicators because they evaluate proactive, preventative approaches to safety rather than reactive ones. Nevertheless, there's value in having tools that account for both types and account for subjective feedback in addition to objective metrics to assess safety performance (Hinze et al. 2013, Rozenfeld et al. 2010, Toellner 2001).

Investigating safety hazards and their causes is an essential step in safety management (Brown 1976, Goetsch 1996, Holt 2001). Following the Occupational Safety and Health Act of 1970, two groups of studies emerged to investigate this aspect of safety management. The first (e.g. Goetsch 1996, Holt 2001) focused on the theory of accident causation integrating knowledge from psychology, sociology, engineering and systems analysis (Wanberg et al. 2013). The second group

of studies based their investigation of accident causation on a situational analysis of the tasks performed or work environments (e.g. Huang and Hinze 2003). The situational analysis approach quantified risk by quantifying the extent to which various work environment-related factors were present in the workplace and the extent to which workers were exposed to workplace hazards. Previous studies investigated accident causation in construction for the purpose of modeling risk assessment and accident prevention. Mitropoulos et al. (2003) suggested an accident causation theory based on the theory that organizational pressures to increase productivity and workers' tendency to want to minimize work push them to take safety risks. Suraji et al. (2001) indicated that a significant portion of construction accidents can be addressed during the design and planning stages before construction even begins, thus the need to alter design to improve safety performance. Gambatese et al. (2005) further stressed the importance of designing for safety.

2.4 Benchmarking Disability Management Performance

The main goal of DM is to support injured employees and enable them to successfully return to work (RTW). A DM program includes policies and practices that aim to minimize production loss, reduce the magnitude of work disability, and prevent injuries or illnesses from becoming chronically disabling (Williams & Westmorland 2002, Krause et al. 2001, Habeck 1996, Gensby et al. 2012). Though most employers are well versed in traditional methods to eliminate workplace safety risks, there's growing interest in reducing their impact should they occur by tracking work absences, facilitating early RTW, and proactively communicating with injured workers and their health-care providers (Shaw et al. 2013).

Construction is a high-risk industry that can be managed through primary and secondary

management strategies. Primary strategies, the focus of the industry are those designed to prevent work-related injuries and illnesses. They include safety programs, pre-placement screening, ergonomic services, safety education, loss prevention programs, health promotion, employee assistance programs and wellness services (Habeck 1996, Tate et al. 1987). Within construction, these strategies are traditionally integrated to the core of project management and project design. Secondary DM strategies focus on managing disability after an injury or illness has occurred. There is little formalization and standardization of these strategies in construction. Related practices tend to be informal and ad hoc in nature. Construction organizations are also less likely to have such policies and practices than employers in other industries (Newton and Ormerod 2005, Lingard and Saunders 2004).

Like most programs, DM programs require on-going evaluation to ensure that they operate effectively and that any issues are identified and addressed effectively (Gensby et al. 2012). These evaluations have focused primarily on ensuring the existence of specific policies and practices, with the use of metrics almost non-existent. Little attempts were made to quantitatively evaluate the specific contribution of DM program components (Krause & Lund 2004). This is a problem given how the mere evaluation of the existence of specific policies and practices is insufficient. For instance, identifying whether a RTW intervention has occurred or not does not enable an evaluation of how well people are doing after that intervention, what type of work they can perform, and their future employment prospects (Krause et al. 2001, Gensby et al. 2012). There is a need to use metrics that would measure aspects such as the length of time for which these people were away from work, related operational and administrative costs and potential cost savings.

Few studies used such metrics. Some used metrics such as time away from work due to sickness or injury (e.g. Tate et al. 1987, Badii et al. 2006), days lost per work related injury (Breslin & Olsheski 1996, Burton & Conti 2000, Bunn et al. 2006), total work lost days (Bernacki et al. 2000), and injury claims (Wood 1987). A study by Breslin & Olsheski (1996) evaluated a transitional RTW program in Cincinnati based on time away from work. Lemstra & Olszynski (2003) investigated an occupational management program for a private meat manufacturing company in Saskatchewan based on workers' compensation injury claims. Only a few studies used measures related to the modification or change of a job function and sustained job retention (Gensby 2005). A criticism of these metrics is that they essentially seek to benchmark safety performance rather than DM. Brooker et al. (2000) believed the evaluation of DM programs should focus on employee-centered outcomes, while Williams and Westmorland (2002) wanted more focus on health-related outcomes. Skisak et al. (2006) measured work absence as the percentage change in average days of absence per employee in managed and non-managed business units. Yassi et al. (1995) measured time losses in total hours lost and time loss per 100,000 paid hours.

Within the benchmarking literature, there are three distinct approaches to the measurement of performance. These are the result-based approach, the compliance-based approach, and the process-based approach (Cambon et al. 2005). The result-based approach uses lagging indicators to benchmark performance whilst the remaining two uses leading indicators. Lagging indicators are usually based on data such as the frequency of on-site accidents, and loss time, with the usefulness of their application challenged by numerous scholars (e.g. Mearns et al. 2003, Hollnagel 2008, Herrera and Hovden 2008, Juglaret et al. 2011). Lagging indicators do not lead to an appropriate in-time rapid response and the introduction of corrective actions because they are

based on historical data (Podgorski 2015). In contrast, leading indicators enable earlier and more efficient intervention and give a good picture of how a given system operates.

CHAPTER 3: RESEARCH METHODOLOGY

This chapter provides an overview of the overall approach and methodology adopted for this research. This is followed by a detailed description of the methods used to accomplish each of the six research objectives.

3.1 Overall Research Approach and Methodology

Research on Disability Management (DM) in construction used a number of methods, including surveys (e.g. Lingard and Saunders 2004, Smallwood and Haupt 2008, Newton and Omerod 2005, Tshoboltwane 2005), case studies (e.g. Clark et al. 2009) and interviews (e.g. Ormerod and Newton, 2013). This research will use a mixed-method approach based on quantitative and qualitative data collection methods as recommended by Olsson (1979) and Creswell (2003). This is to enable the study of the complex interactions between the various DM practices as recommended by Campbell and Fiske (1959), Webb et al. (1966), Burgess (1982) and Brannen (1992). The mixed approach used is both objective and subjective, as recommended by Bryman (1992) and Dainty (2007) for construction management research. Table 1 shows the specific types of studies reviewed for this research, highlighting the contribution of each to the research.

Table 1: Contributions of Existing Relevant Studies to Research

Study Type	Contribution	Authors
Studies on DM	Provide insight into implementation of DM and an understanding of various aspects of DM. Inform development of best practices	Colella (1994), Corker (2000), Dibben et al (2000),Galvin et al (1986), Harder et al (2006), Hursh (1997), Krause et al (1998), OHSAH (2010), OECD (2010), Rieth et al (1995), Rogers (1993), Rosenthal et al (2007),Shrey, (1995), Tate et al (1989), Angeloni, (2013)
Studies on DM in construction	Enable focus on peculiarities of DM in construction and on latest research in the field	Clarke et al, (2009), Lingard and Saunders (2004), Newton and Ormerod, (2005) (2013), Smallwood and Haupt (2008), Tshobotlwane (2005),
Studies on maturity modelling	Provide theoretical foundation for maturity model. Enable development of model	Crosby (1979), Dorfman (2000), Finnemore et al (2000), Lockamy and McCormack (2004), Mani et al (2010), Vaidyanathan and Howell (2007), Willis and Rankin (2009)
Studies on DM implementation	Enable identification of key practice areas of DM and DM metrics. Inform development of leading and lagging indicators of DM.	Cheadle et al (1994), Stone and Colella (1996), Shrey and Hursh (1999), Brooker et al (2012), Gervais (2003), Liao and Chiang (2015), National Institute of Disability Management and Research (2003), The Conference Board of Canada (2013), Lingard, and Saunders (2004)
Studies on construction safety performance	Enable identification of safety performance metrics.	Hinze et al., 2013; Sgourou et al., 2010; Sgourou et al., 2010; Ng et al., 2005; Reiman and Pietikäinen, 2012

Figure 2 depicts the overall research methodology.

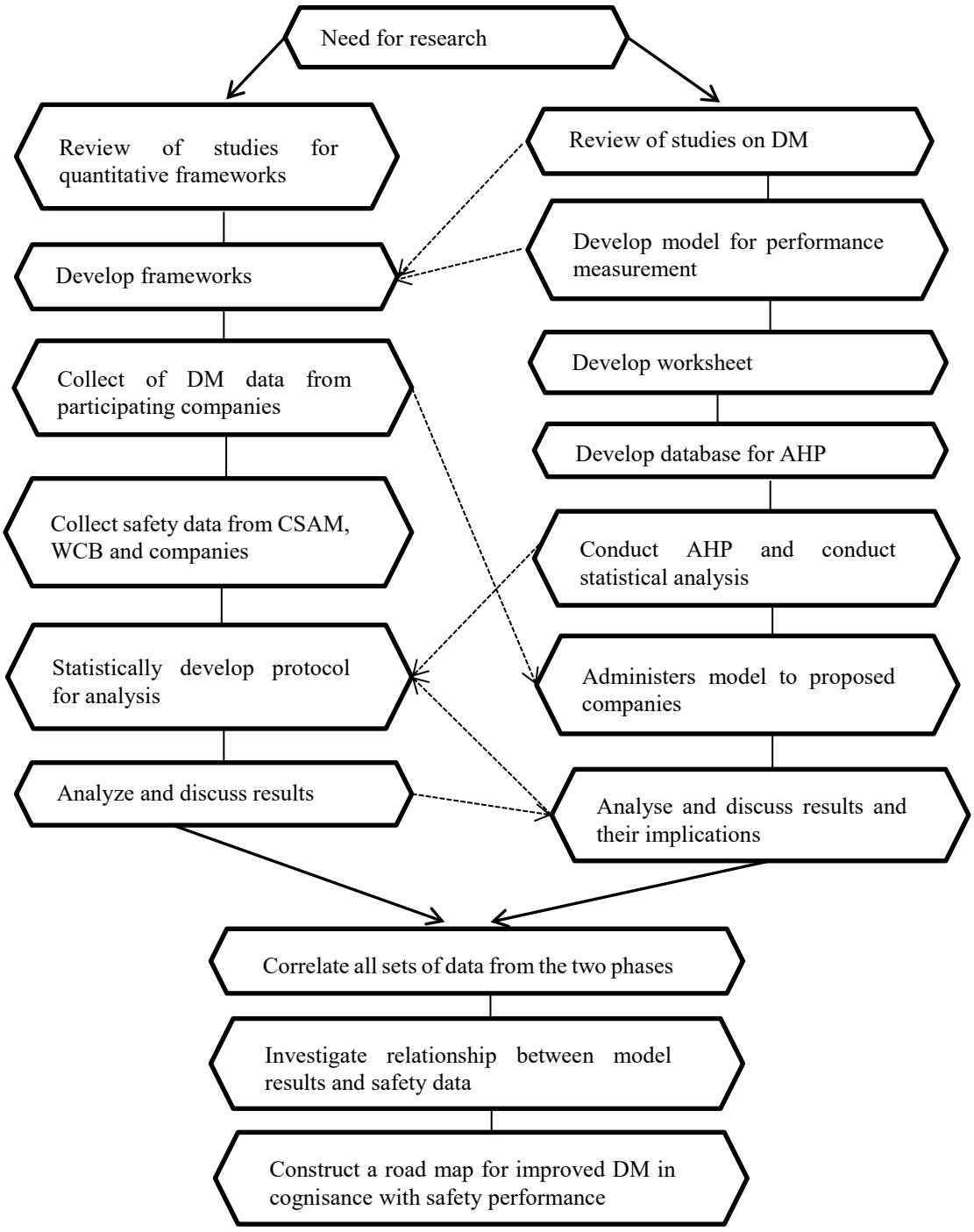

Figure 2: Research Methodology

3.2 Objective #1: Evaluating Status of Disability Management

in Manitoban Construction Industry

This section describes the data collection and analysis methods used to evaluate DM in the Manitoban construction industry.

3.2.1 Data Collection

The research involved designing and administrating a web-based anonymous survey to construction companies in Manitoba through the Construction Safety Association of Manitoba (CSAM). The survey contained 18 questions: 17 closed-ended quantitative questions and only one open-ended qualitative one. The majority were closed-ended because these questions were usually quicker to answer and simpler to deal with. One open-ended question was added to enable respondents to articulate their views and address aspects not covered by closed-ended questions. Furthermore, where appropriate, closed-ended questions included an "Other: please specify" option to give respondents an opportunity to add to the options offered by the actual questionnaire. Appendix A and B show copies of the survey consent form and actual questionnaire administered.

Table 2 summarizes the design and content of the questionnaire. As shown in the table, the questionnaire enquired about the type of organizations respondents worked in, their role within the organization and the type of work their organization did. The questionnaire also enquired about whether their organization was certified according to the Certificate of Recognition Program (COR), the number of employees within their organizations and the percentage of disabled employees within them. Respondents were asked to rank the most common disabilities found in their organizations as a result of workplace injuries, barriers to the successful return of disabled workers following a work injury and reasons why construction organizations should have DM and

RTW programs. The questionnaire enquired about responding organizations' implementation of a DM program and the specific practices, accommodations and resources used as part of these programs. Responding organizations were also asked to indicate their level of agreement or disagreement with a number of conclusions derived from the literature about injured workers returning to the workplace with a disability. They were asked about their perception of financial incentives aimed at encouraging the adoption of DM programs and their awareness of the WCB's role.

Table 2: Design and Content of Survey Questionnaire

Question Numbers	Question Types	Issues Investigated
Questions 1 – 4	Multiple choice	Demographics of responding organization
Questions 5 – 6	Multiple choice	Size of organization and organization's employment of disabled workers
Questions 7 – 8	Ranking	Disabilities accommodated by organization, barriers to return of disabled workers
Questions 9 – 11	Ranking, Yes/ No	Organization's implementation of DM program, rationale for implementing DM program
Questions 12 – 14	Multiple choice	Practices, accommodations and resources used by organization as part of DM program
Question 15	Rating	Organization's perception of literature results
Question 16 – 17	Yes/ No	Organization's perception of financial incentives to develop DM program and of WCB's role
Question 18	Open-ended	Additional comments about topic

The research involved sending the survey out to approximately 2,000 CSAM members in total, consisting of electrical, general, mechanical and trade contractors. A link was added to CSAM's homepage and a direct email inviting members to complete the survey was sent out to members two weeks later. The survey was made available electronically for five consecutive weeks, resulting in a total of 88 survey responses received, and thus making for a confidence level of 95% and a confidence interval of 10%. It was reviewed and approved by the University of Manitoba Research Ethics Board prior to its deployment. Appendix C shows a copy of the ethics approval

certificate.

3.2.2 Data Analysis

Descriptive statistics were used to analyze the results, with inferential statistics used in a few instances only to evaluate the statistical significance of some results at $p = 0.05$ (95% level of confidence). The two nonparametric tests used to analyze survey results included the Spearman's Rank Correlation Coefficient (SRCC) test and the Kruskal-Wallis (KW) test. The SRCC test was used to assess the relationship between: 1) Organizations' total number of employees and the percentage of disabled employees in them, 2) Organizations' COR certification and their implementation of a DM program and 3) Organizations' perception of financial incentives aimed at developing or improving DM programs and their implementation of a DM program. The Kruskal-Wallis (KW) test was used to determine if there were statistically significant differences in the: 1) Percentage of disabled employees in different types of organizations (i.e. electrical contractor, general contractor, mechanical contractor, trade contractor), 2) Percentage of disabled employees in organizations doing different types of work (i.e. residential, commercial/ institutional, industrial, heavy/ civil), 3) Disabilities accommodated by different types of organizations and 4) Disabilities accommodated by organizations doing different types of work.

3.3 Objective #2: Developing and Validating Disability Management Indicators for Construction Organizations

This section presents the methods used to develop and validate DM indicators for the construction industry. It also includes a list of those indicators, their definitions and key inherent best practices

within each. This is followed by a description of the analytical hierarchy process (AHP) used to validate them.

3.3.1 Indicators Development

The research involved developing 12 main DM indicators that can be used to assess construction organizations' policies and practices and forecast how well a company is expected to perform with respect to DM. Each indicator represents "a quantitative or qualitative factor or variable that provides a reliable means to measure achievement, to reflect changes connected to an intervention, or to help assess the performance of a development actor" (OECD/DAC 2010). Developing the indicators involved identifying existing DM practices from an extensive literature review, and then formulating the DM indicators relevant to construction using the process outlined below:

- Literature selection for review: The literature review entailed searching the University of Manitoba library and the online research databases including Scopus, Compendex, and ScienceDirect for relevant documents using the terms: "DM, DM practices, DM performance measurement, DM indicators, DM assessment framework, DM assessment model, DM performance evaluation, construction injury management, and construction DM".

- Literature breakdown: The literature search identified a total of 97 relevant documents: 69 journal papers, 11 standard documents, 9 books and 8 conference papers. Of the 69 journal papers found, only eight investigated DM in construction, with only one study conducted within Canada. The remaining journal papers (i.e. 61) studied DM in relation to other

industries such as the services industry, medical field and business management, with the majority being more generic in focus. The majority of the papers were published in journals focusing on disability rehabilitation, such as Safety Science, Journal of Vocational Rehabilitation, Rehabilitation Counselling Bulletin and Psychiatric Rehabilitation Journal. Five of the standard documents were published within Canada, while the remaining 6 were from other countries such as the United Kingdom, United States and Australia. All of the 97 documents were analyzed to identify the relevant existing DM best practices in the literature.

- Articles review: The full 97 documents were reviewed using an iterative process to identify the DM practices inherent in them and the DM characteristics and issues that can be translated to DM practices. These practices formed the basis of the developed indicators. Only practices that had been implemented and validated within a workplace or community-based environment were included. These practices were categorized under 15 different themes. These themes included: 1) Early contact interventions, 2) Workplace assessment, 3) Case management/coordination, 4) RTW policies, 5) Workplace accommodations, 6) Modified work, 7) Transitional work opportunities, 8) Alternative placements, 9) Revision of workplace roles, 10) Employee participation, 11) Labour-management commitment, 12) Education of employees, 13) Rehabilitation services, 14) Information systems and 15) Preventative strategies. In doing so, practices with similar outcomes and procedures were grouped and coded. These themes provided the basis for sorting the practices, while also providing a framework by which the indicators were constructed and defined.

- DM indicators and practices definitions: Only practices that were applicable and relevant to the construction industry were included in the final version of the indicators and practices. In doing this, the relevance and appropriateness of the practices were assessed against the nature and characteristics of construction projects, project outcomes and health and safety best practices. The indicators were then formulated using a constant comparative analysis process. This involved analyzing which practices assessed and encompassed similar characteristics, narrowing them down and merging them where appropriate, resulting in 12 different categories of practices or indicators. These categories were then named according to the dominant characteristic that ran through the practices making up each.

The 12 indicators were divided into two main categories based on their applicability as follows: organizational-level indicators and individual-level indicators. Organizational indicators encompassed those practices that do not target the individual worker in particular, but cut across the entire organization. Individual indicators focused on the individual worker without necessarily targeting every worker within the organization. For instance, case management practices apply only to workers injured on site and thus require specific accommodations to recover and return back to work. Table 3 includes definitions of these 12 indicators, associated key practices and references to these practices in the DM literature.

Table 3: Proposed DM Indicators, Associated Key Practices and Relevant Literature

Indicators	Definition	Key Practices	References
Communication practices	These practices aim to provide information to all employees on disability,	-Information routes -Policy change communications	Brooker et al. 2012, Westmorland et al. 2005, Muriel et al, 2005, Loisel et

	injury and safety in the workplace, along with specific information about the strategy of the organization with respect to health and safety.	-Open communication management with employees -Early intervention communication -Employee knowledge assessment	al., 2013, The Conference Board of Canada, 2013; Habeck et al. 1991; Dyck, 2006; Tate et al. 1986; Shrey, 1995
Case management practices	These practices aim to plan, implement, coordinate, monitor and evaluate the options and services required to meet employee health and rehabilitation needs.	-Post-RTW monitoring and coordination -Initial assessment of physical and functional rehabilitation -Occupational rehabilitation counseling and job skill retraining	Brooker et al. 2012, Marek et al. 2010, Kong, et al, 2012, Salazar et al, 1999; Hunt & Habeck, 1999; Shrey & Olsheski, 1992, OHSAH, 2010; The Conference Board of Canada, 2013; Welch et al. 1999
Return to work practices	These practices aim to integrate employees who have been injured or have a disability back to the workplace by providing services such as job needs assessment and modified work.	-Job needs assessment -Job analysis -Functional assessment -Job and workstation modification -Vocational assessment and job placement for employees unable to return to original positions -Intermediate evaluation of progress	Lidwall, 2015, OHSAH, 2010, Westmorland et al. 2005, Grace et al. 2013, The Conference Board of Canada, 2013, Habeck et al. 1991; Dyck, 2006; Tate et al. 1986; Shrey, 1995; Krause et al. 1998; Schwartz et al. 1989; Hunt & Habeck, 1999; Shrey & Olsheski, 1992; He et al. 2010; OHSAH, 2010; Harder and Scott, 2003; Winter et al. 2015
Claims management practices	These practices aim to manage claims related to occupational and non-occupational injuries or illnesses that may entitle individual employees to long-term disability benefits.	-Claims management from initial injury to claim resolution -Evaluation of long-duration claims	Hughes and Barber, 1992, Amr and Nemr 2008, Irving 2010, Habeck et al. 1991; Dyck, 2006; Tate et al. 1986; Shrey, 1995; Thomason et al. 2001; Hassanein and Nemr, 2008; OHSAH, 2010
Disability and injury prevention practices	These practices aim to provide preventative measures to alleviate injuries and educate employees on these aspects before the	-Workplace safety programs -Hazard management -Health and welfare programs -Project site safety	Maiwald 2011, Davis 2004, Badii 2006, Feldstein A, et al. 1998 Habeck et al. 1991; Dyck, 2006; Tate et al. 1986; Shrey, 1995; Krause et al. 1998; Harder and

	occurrence of disabling injuries.	-First aid -Educational safety awareness programs -Mental health and stress management programs	Scott, 2003; Hansen, 1997; Intracorp, 1999; Kochaniec, 1999; Rogers, 1995; Shrey and Lacerte 1995; OHSAH, 2010; Johnson et al, 1996
Transitional program management practices	These practices aim to provide generic DM programs for injured employees, which will be customised to individual employees during case management.	-Workplace job accommodation -Transitional jobs breakdown -Organizational level modified duties -Organizational level occupational training	Radey and Wilkins 2010, The Conference Board of Canada, 2013; Habeck et al. 1991; Dyck, 2006; Tate et al. 1986; Shrey, 1995; Krause et al. 1998; Shrey and Hursh 1999; Schwartz, 1989; Westmorland et al. 2005
Physical accessibility management practices	These practices aim to improve the physical accessibility of construction workplaces to people with disabilities and as such cover physical workplace accessibility requirements.	-Workplace and project site accessibility -Training for staff on physical implications of disability -Workstation Accessibility	Barnes and Mercer, 2005; Wilton and Schuer, 2006, Newton et al. 2007, Hunt & Habeck, 1999; Shrey & Olsheski, 1992; Newton et al. 2007; McCampbell 1995
Senior management support practices	These practices aim to provide continuous and consistent support from senior management to ensure the effective implementation of DM programs.	-Senior management role -Management and financial support of safety programs -Management support of RTW, modified work and related financial commitments	Dibben et al. 2001, Westmorland et al. 2005, Caveen, et al., 2006; Mizzoni & Kirsh, 2006, Licoppe & Jarjoura 2016, Tortarolo and Polakoff, 1995, Lipold, 2000, Storrer, 2000, Polakoff, 1993, Westmorland and Buys, 2004; Habeck et al. 1991; Dyck, 2006; Tate et al. 1986; Shrey, 1995
Program evaluation practices	These practices aim to assess DM procedures, regulations and practices within the organization.	-Workplace incidents data collection -Case management evaluation -RTW evaluation -Injury and illness statistics analysis -Program modifications and improvements	OHSAH, 2010, Jacobson et al. 2013, The Conference Board of Canada, 2013; Hunt & Habeck, 1999; Shrey & Olsheski, 1992; Robinson et al. 2014

Regulatory and compliance policies	These policies aim to ensure compliance of policies developed by organization to accommodate injured and disabled employees with existing policies at the federal and provincial levels.	-Salary replacement policies -Job accommodation and transitional policies -Employment and budgetary responsibility policies -Vocational training polices	OHSAH, 2010, The Conference Board of Canada, 2013; Westmorland et al. 2005; Smallwood and Haupt, 2008 Habeck & Kirchner, 1999
Recruitment and retention policies	These policies aim to assess the recruitment process of employees in the construction workplace as well the procedures undertaken to ensure the retention of injured workers. The principle of non-discrimination should be respected throughout the process.	-Recruitment polices (diversity management) - Pre-employment tests and selection criteria -Retention and gradual resumption of work measures -Support and technical advice to identify any opportunities and adjustments	OHSAH, 2010, IRS, 1996, Dibben, *et al*, 2000, Thomason et al. 1989; Harder and Scott, 2005; Westmorland et al. 2005, Habeck & Kirchner, 1999
Ergonomic practices	These practices aim to ensure the design of work processes and spaces that minimise injuries, complaints, staff turnover and work absenteeism.	-Jobs designed to reduce heavy lifting -Ergonomic strategies for workstations and work areas -Ergonomic considerations in purchasing new tools, equipment, or furniture -Ergonomic approaches to assist disabled workers	Johansson and Rubenowitz, 1992; Johansson, 1994, Thompson el la, 2003, Westmorland et al. 2005, Udosen, 2006, Westmorland and Buys, 2004; Winter et al. 2015

3.3.2 Indicators Validation

As part of validating the developed indicators, an Analytical Hierarchy Process (AHP) was used to determine their relative weights of importance in relation to overall DM performance. AHP is a structured method used to determine the relative importance of different criteria (Saaty 1996). Numerical scales are attributed by making pairwise comparisons of these criteria with respect to

their impact on an element placed in a superior level in the hierarchy (Aminbakhsh et al. 2013). The method can be used to solve complex problems that are difficult to quantify for purposes such as contractor selection (Lin et al. 2008), safety management (Aminbakhsh et al. 2013) and technology, equipment, and material selection (Lin et al. 2008). Because AHP uses the geometric means of individual respondents, it can reduce the impact of outliers on aggregated expert judgments. AHP derives scales of values from pairwise comparisons in conjunction with ratings, making it suitable for multi-objective, multi-criterion, and multi-actor decisions (Aminbakhsh et al. 2013). It represents a trade-off between experts' objective and subjective judgments (Saaty 1996), making it more reliable to use than other multi-criteria decision-making methods (Sambasivan and Fei 2008).

The research involved recruiting eight DM, construction and health and safety experts from Manitoba for the purpose of conducting the AHP. These experts were required to have extensive knowledge of DM within Manitoba, with at least 10 years working experience. Table 4 shows their main attributes.

Table 4: Main Attributes of AHP Experts

Expert	Educational Level	Years of Experience	Position/ Field of Expertise
1	MSc (Civil Engineering)	26	Project Manager/ Case Management Specialist
2	PhD (Disability Studies)	20	Researcher
3	BSc (Civil Engineering)	18	Safety Officer
4	MSc (Project Management)	19	Project Manager/Contractor
5	MSc (Civil Engineering)	14	Safety Manager
6	BSc (Civil Engineering)	15	Project Manager/Contractor
7	MSc (Civil Engineering)	13	Project Manager/safety officer
8	BSc (Civil Engineering)	12	Safety Officer

Because of ethical considerations, the AHP was conducted separately with each expert. Separate meetings were scheduled with six of the eight experts, with each expert briefed during that meeting about the process. The two other experts participated in the process via email and phone due to conflicting schedules. Each expert was tasked with carrying out pairwise comparisons of the 12 indicators by determining the level of importance of one indicator versus another to construction organizations' DM performance. Appendix D shows a copy of the instructional sheet provided to each expert and that described the process in detail to them, including what is expected of them. The comparisons were made using the nine-point fundamental scale develop by Saaty (1987), and ranging from "equal importance" (1) of the two indicators to "extreme importance" (9) of one indicator versus another. This nine-point scale was preferred over an abbreviated five-point scale to reduce the level of fuzziness associated with experts' judgements. The process also allowed for experts to justify their respective ratings. Before the start of the AHP, each expert was required to sign a consent form, a copy of which can be found in Appendix E. The whole AHP was also reviewed and approved by the University of Manitoba Research Ethics Board. Appendix F shows the relevant ethics approval certificate.

The pairwise comparisons conducted by each expert produced a pairwise comparison matrix. The values in the matrix within each column were known as pairwise comparison judgments and reflected the relative importance of each indicator for each expert. These values were normalized, producing ratio scales in the form of principal eigenvectors or Eigen functions (Saaty 1987). The normalization entailed dividing each value for each indicator in a column by the sum of values within the same column such that the sum of each column's values is 1. The consistency ratio of

the pairwise judgments for each expect was calculated to determine the reliability of the pairwise comparisons and the potential for rank reversal. The final sets of weights of importance representing the consensus of the expert group were then determined using the aggregation of individual judgments approach. Fundamentally, for each set of indicators compared, the pairwise judgments provided by each expert were aggregated using geometric means to produce a single set of pairwise comparison judgments (Forman and Peniwati 1998). These were then normalized in the same manner described earlier to produce a final set of weights of importance. Once this was done, the indicators were ranked from the most important to the least important based on their weights of importance.

3.4 Objective #3: Developing and Implementing Construction Disability Management Maturity Model

This section presents the methods used to develop and implement the DM maturity model, also known as the Construction Disability Management Maturity Model (CDM3) and that was based in part on the indicators developed in the previous section. A comprehensive overview of the model is also included in this section.

3.4.1 Maturity Model Development

The development of the CDM3 was based on the 12 DM indicators developed as part of the previous objective. These indicators formed the foundation of the model with the practices inherent in them forming the best practices that represent the performance benchmarks against which a construction organization's practices are compared. In its final form, the CDM3 aims to define key

DM best practices in the literature, and evaluate the maturity of construction organizations' DM practices against these best practices, providing guidance for improving these organizations' overall DM. The CDM3 incorporates the twelve indicators developed as part of the previous objective, which are divided into two different categories based on their level of implementation and applicability: organizational level indicators and individual level indicators. These indicators represent clusters of related activities, which when adhered to enable the achievement of performance goals. They represent the independent variables of the model, with the dependent variable being DM performance. The model assumes that higher maturity of each indicator will translate to higher levels of DM performance. Figure 3 depicts the structure of the proposed model graphically. A detailed description of these indicators and the inherent practices within each can be found in Table 3.

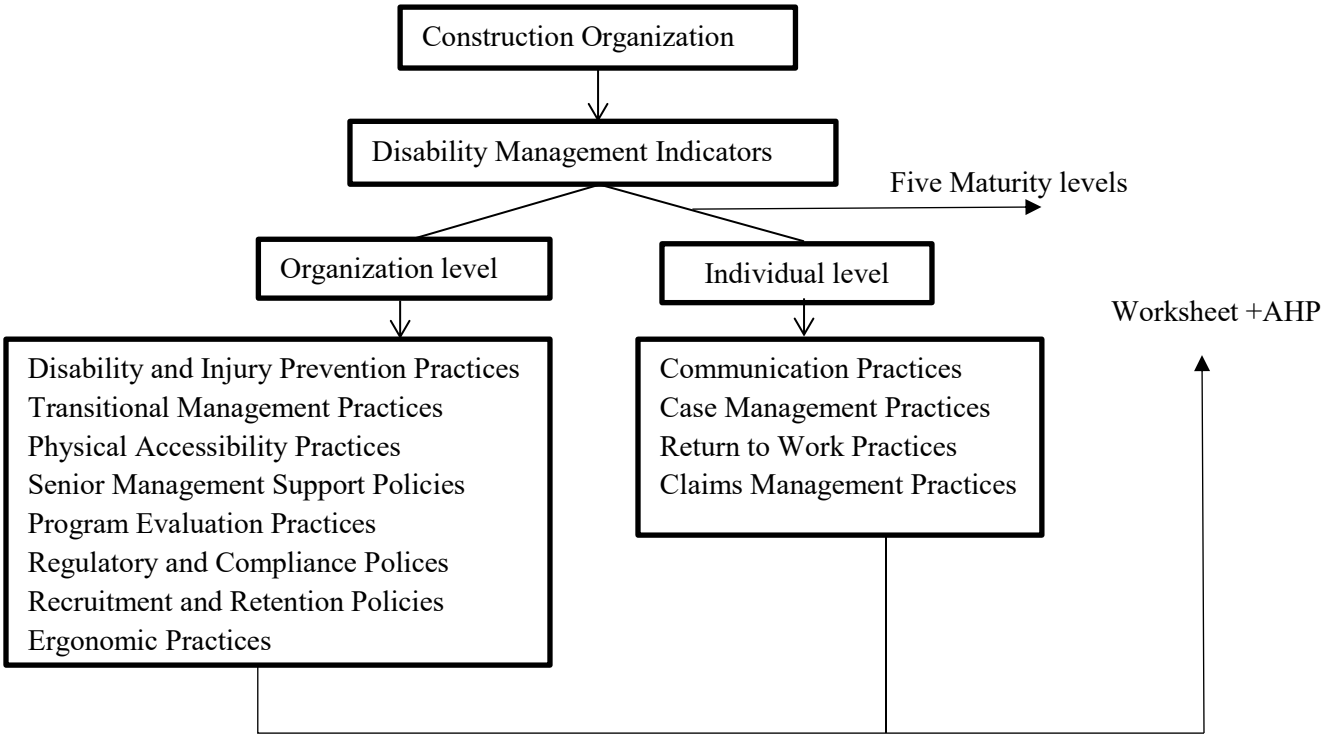

Figure 3: Structure of CDM3

The research adopts for the CDM3 the maturity scales used by the Capability Maturity Model Integration and SPICE. The CDM3 has five distinct maturity levels to enable continuous improvement of organizational practices and the attainment of the highest level of process maturity. As shown in Figure 4, each level represents a well-defined stage, the characteristics of which are described below.

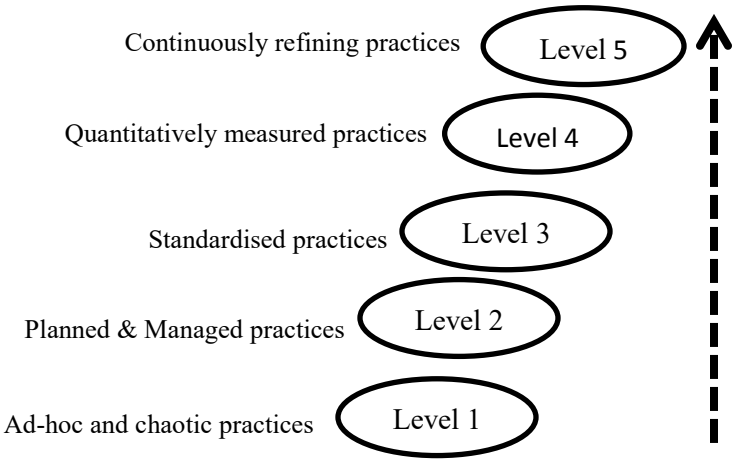

Figure 4:CDM3 Maturity Scale

- *At maturity level 1*: Organizational processes are ad hoc and chaotic (CMMI Product Team, 2002). No procedures or policies are defined or implemented. Organizations' DM performance usually depends on the competence of organizational members rather than the application of specific DM practices.

- *At maturity level 2*: Organizational processes are planned, implemented, measured, and controlled to a degree although not standardized. This level implies that DM requirements

practices and results are visible but not wholly synergized.

- At maturity level 3: Organizational processes are standardised with respect to DM practices, that is, they are defined, implemented, managed and used consistently across the organization.

- At maturity level 4: Organizational processes are implemented accurately and efficiently in accordance with quality control standards and performance measurement. Performance data is collected and evaluated against internal and external benchmarks to identify causes of process variation.

- At maturity level 5: Organizational processes are continually improved upon to address process variation and achieve optimal efficiency by establishing new quantitative objectives and benchmarks.

3.4.2 Maturity Model Implementation

An assessment questionnaire, a copy of which can be found in Appendix G was developed to implement the CDM3 and evaluate the extent to which each organization implemented each indicator and each best practice inherent within it. The assessment worksheet assessed the 12 indicators making up the CDM3 using a total of 134 close-ended, Likert scale questions, with each indicator assessed using a specific number of questions. Each question represented a specific best practice, with each responding organization required to rate the extent to which it implemented that best practice using a range of responses ranging from “Strongly Disagree” (1) to “Strongly Agree” (5). The worksheet was designed so that it could be completed by more than one individual

within the organization. Random verifications of the responses provided were conducted to ensure their accuracy and improve the validity and rigour of the assessment. These verifications involved checking project and organizational documents and conducting direct observations when appropriate. The worksheet was reviewed and approved by the University of Manitoba Research Ethics Board prior to its eventual deployment. Appendix H shows the relevant ethics approval certificate whereas Table 5 shows the breakdown of the questions making up the assessment worksheet.

Table 5: Breakdown of Assessment Worksheet

Assessment Questions/ Best Practices Numbers	Indicator
1-11	Communication practices
12-29	Individual case management practices
30-39	Return to work practices
40-44	Claims management practices
45-69	Disability and injury prevention practices
70-83	Transitional program management practices
84-88	Physical accessibility management practices
89-101	Program evaluation practices
102-105	Senior management support practices
106-110	Regulatory & Compliance Policies
111-124	Recruitment and Retention Policies
125-134	Ergonomic Practices

The model was used to evaluate ten construction companies in Manitoba. The participating companies, the characteristics of which are shown in Table 6 were recruited through the Winnipeg Construction Association (WCA) using a stratified sampling technique. The WCA had 108 general construction member companies which formed the total population of general construction companies for this research. These companies were divided into different strata or categories depending on their size, with random sampling used to select a sufficient number of companies from within each stratum. A sample size of 85 companies was required to ensure a confidence

level of 95% and at 10% margin of error (Krejcie and Morgan 1970). However due to time and human resource limitations, the sample size was limited to a maximum of 10 companies. Although this means that the results cannot be generalized to the entire population of general construction firms in Manitoba, the research produced a body of knowledge that provides a rigorous foundation upon which further studies can be built.

Table 6: Characteristics of Participating Companies

Company	Area of Operation	Number of Employees	Size	Annual Revenue (in millions of $)	Respondents
Company 1	Building	0-100	Small	13.7	2
Company 2	Building/Civil	<100	Medium	12.5	2
Company 3	Building	0-100	Small	2.66	1
Company 4	Building	<100	Medium	15.66	1
Company 5	Building/Civil	<100	Medium	13.3	3
Company 6	Building	0-100	Small	2.54	2
Company 7	Building/ Non-Residential	0-100	Small	6.88	2
Company 8	Building/Non-Residential	<100	Medium	13.8	2
Company 9	Building/Civil	<100	Medium	15.1	1
Company 10	Building/Civil	<500	Large	50	3

On the actual interview day, each company that agreed to participate in the research was required to sign the consent form shown in Appendix I. The interview involved going through the assessment worksheet with the health and safety or DM coordinator of the company one indicator and one best practice at a time and took on average an hour. The companies were categorized based on the number of their employees as defined by Industry Canada (2014). Companies with less than 100 employees were classified as small. The ones employing between 100 and less than 500 employees were considered medium, and the ones with 500 employees or more were categorized as large companies.

3.4.3 Data Analysis

Cronbach's alpha was calculated to measure the validity and reliability of the assessment worksheet, that is the extent to which the items in the worksheet provided consistent information with regards to the data (Cortina 1993). The alpha value ranges in value between 0 and 1, with values close to 1 indicating high consistency (Cortina (1993). Values of 0.70 or higher generally indicate an acceptable level of reliability, although the interpretation of alpha values in specific contexts can be more complex (Schmitt 1996).

To assess company's responses to the assessment worksheet, the actual ratings of every company's responses to the questions and practices within every indicator were summed up to produce the *Actual Score Indicator* (AS). That score was divided by the optimal score for the indicator (i.e. *Optimal Score Indicator* (OS)) which assumed a rating of 5 for every practice within that indicator to derive the corresponding percentage score (i.e. *AS Indicator %*). That percentage score was multiplied by the highest maturity level of 5 to derive the initial maturity score for each indicator (i.e. *MS Indicator*) as per Equation 1. That *MS Indicator* aimed to quantify the relative contribution of each indicator to the overall maturity of the company and thus determine the key practices that are making the greatest contribution to it without taking into account the weight of importance of every indicator. A comparison of the *MS Indicator* for different indicators within the same company can also determine the extent to which every indicator is prioritized within the company. That *MS indicator* for each indicator was then summed up as per Equation 2 to calculate the overall maturity score for each company without taking into account the AHP weights of importance (i.e. *MS Company w/AHP*). Another maturity score that took AHP weights of importance into consideration (i.e. *MS Company*) was calculated for each company by multiplying the *MS*

Indicator for each indicator by its weight of importance (i.e. *AHP weight*) and summing up the resulting product for all indicators as per Equation 3. A comparison of these maturity scores (i.e. *MS Indicator*, *MS Company* and *MS Company w/AHP*) across different companies can help determine the level of influence of key indicators on overall DM performance. The potential maturity growth for each company at the indicator (i.e. *PG Indicator*) and company (i.e. *PG Company*) levels was also calculated using equations 4 and 5 respectively by finding the percentage difference between the optimal maturity score of 5 and the *MS Indicator* and *MS Company* respectively. This potential growth represented the amount of development and growth required to reach the continuously refining practices level (level 5) of performance. It also helped determine the extent to which the objectives associated with each key indicator are being achieved and the level at which an indicator is operating.

$$MS\ Indicator = \frac{\sum (AS\ Indicator)}{OS\ Indicator} x\ 5 \quad \text{Equation 1}$$

$$MS\ Company\ w/AHP = \sum (MS\ Indicators) \quad \text{Equation 2}$$

$$MS\ Company = \sum (MS\ Indicators) x\ AHP\ weights \quad \text{Equation 3}$$

$$PG\ Indicator = \frac{(5 - MS\ Indicator)}{5} x100 = 100 - AS\ Indicator\ \% \quad \text{Equation 4}$$

$$PG\ Company = \frac{(5 - MS\ Company)}{5} x100 \quad \text{Equation 5}$$

The analysis involved evaluating the maturity performance of the participating companies and investigating the most mature and least mature companies with their most mature and least mature indicators. This was followed by an evaluation of the maturity performance of these companies in relation to their weights of importance. The research also involved evaluating the maturity performance of these companies as a function of their size, and the maturity of the different

indicators across these companies and in relation to their weights of importance. A sample case study of the maturity of Company 1 in particular and of its indicators is also presented to demonstrate how the CDM3 can be applied to evaluate the DM practices of an individual construction organization.

When companies' overall DM maturity score (MS) are compared to one another, their MS help determines the level of influence of key DM indicators on overall DM performance. When the MS of key indicators is compared to one another for any one company, these MS can help determine the extent to which every indicator is prioritized within the company. When the MS of each key indicator is compared to its maximum possible potential growth, this MS can help determine the extent to which the objectives associated with each key indicator are being achieved and the level at which an indicator is operating. While the sample size does not allow for the generalization of the results, it can provide key insights into how companies approach DM and where improvements are possible.

3.5 Objective #4: Developing and Implementing Disability Management and Safety Metrics for Construction Organizations

This section describes the methods used to develop and implement safety and DM metrics to evaluate the safety and DM performance of the construction industry respectively. The section includes a full list of these developed metrics, their definitions and the formulas used to calculate each.

3.5.1 Metrics Development

This research involved reviewing the construction safety and DM literature to identify the metrics used to evaluate contractors' safety and DM performance. The literature was not only limited to the scientific journal and conference publications found in databases such as SCOPUS and Science Direct but extended to public and government agencies such as the Occupational Safety and Health Administration (OSHA) and the Workers Compensation Boards in the different provinces in Canada. The review involved identifying the most important safety and DM performance metrics used in the literature and selecting the ones to use in the research. The metrics selected for the research had to satisfy two main criteria. The metrics needed to have been widely used, tested and validated. They also needed to allow for the evaluation of DM performance at the organizational level.

Given the scarce DM metrics in the literature, the research involved developing new DM metrics based on the 12 DM indicators identified as part of the second objective of this research. The development of these metrics relied on (1) a detailed literature review of existing DM practices, (2) the feedback obtained from industry experts and companies participating in the first, second and third objectives of the research and (3) the experience of the researchers working on the study. In formulating these metrics, the underlying practices under each of the indictors were analyzed to determine which practices could be measured, quantified and tracked using such metrics.

Table 7 lists the safety and DM metrics found in the literature and selected for this research. A

definition of each metric is provided in the table as well as the formula used to calculate it. There is a need to make the distinction between safety and DM given the clear overlap between the two aspects. These metrics provide evidence that can be used to assess safety and DM performance across construction organizations and enable cross-organizational comparisons. These are metrics used and validated widely by OSHA, the WCB, insurance companies, facility owners, researchers and other construction practitioners. Two standard bases have been used in the past: 1,000,000 person-hours and 200,000 person hours. The latter base (200,000 person-hours is nominally equivalent to 100 person-years) is widely used in the industry.

Table 7: Safety and DM Metrics in Literature

Metric	Definition	Formula	Sources
Reportable incidents/Accident Rate/ Recordable Injury Rate	The number of reported incidents per 200000 work hours.	Number of reported incidents *200,000/ Total work hours	Rankin et al. 2008; Cha and Kim, 2011; Hinze et al. 2013; Yun et al. 2016; Jannadi, 1995; Wanberg et al., 2013; Nasir et al. 2012
Lost Time	The number of incidents that resulted in lost time per 200000 work hours	Number of time lost incidents/cases*200,000/ Total work hours	Rankin et al. 2008; Nassar and AbouRizk, 2014; Nasir et al. 2012;
First-aid Injury Rate	The amount of first-aid injuries per 200000 work hours.	Number of Accident*200,000/Total work hours	Wanberg et al., 2013; Cha and Kim, 2011
Safety Cost Ratio	The amount spent on safety issues against total revenue.	Safety Cost /Revenue	Cha and Kim, 2011; Jannadi, 1995
Safety Education	The amount of training of employees per gross area	Number of Training hours of employees/Gross Area of company	Cha et al. 2011; Jannadi, 1995
Days Away/Restricted or Transfer (DART) Rate	The number of recordable injuries and illnesses that occur among a given number of full-time workers over a given period of time.	Number of incidents that resulted in days away from work, restricted activity and/or job transfer *200000/ Total work hours	Hinze et al. 2013; Cha and Kim, 2011; Grabowski et al., 2007; Yun et al. 2016
Severity Rate	The number of days lost to incidents per 200000 work hours.	Number of days lost to incidents * 200,000/ Total work hours	Hinze et al. 2013; Yun et al. 2016
Loss Ratio	The cost of claims against the cost of premiums	Cost of claims/Cost of premiums	Hinze et al. 2013; Jannadi, 1995; Grabowski et al., 2007
Number of Liability Claims	The number of liability claims associated with worksite injuries	Number of claims	Hinze et al. 2013; Cox et al. 2003; Grabowski et al., 2007

Table 8 shows the new 13 DM metrics developed for this research. These metrics can be tracked on a monthly, quarterly or annual basis to benchmark DM performance at the organizational level.

Table 8: New DM Metrics Proposed

Metric	Definition	Formula	Relevance	Practice
DM1	Percentage of workers and their safety representatives involved planning of DM.	(Total number of workers and their safety representatives involved planning of DM / Total number of workers) *100	This metric seeks to measure the involvement and overall integration of workers within an organization's DM program. Clear and timely communication is key in creating more responsible and empowered workers, as well save cut down costs. The higher the percentage the higher the level of integration and communication lines between management and workers.	Communication & Disability injury prevention, Program Evaluation
DM2	Percentage of workers provided with health and safety training on a regular basis.	(Total number of workers provided with health and safety training/ Total number of workers)*100	This metric seeks to measure to extent to which organizations train their workers on health and safety issues within the workplace, there by preventing accidents due to ignorance of safety procedures. The higher the percentage the higher the level of integration and awareness of workers on hazards management and injury prevention practices.	Communication & Disability injury prevention, Program Evaluation
DM3	Percentage of workers participating averagely in site safety meetings.	(Total number of workers participating in site safety meetings / Total number of workers)*100	This metric seeks to measure the level of integration of workers in the safety management on projects within the organization. Every project has its unique characteristics in terms of	Communication & Disability injury prevention, Program Evaluation

			potential hazards and workers must be knowledgeable in these to prevent accidents on site. The higher the percentage the higher the level of integration.	
DM4	Ratio of workers who returned back from injury	(Total number of workers who returned back from injury leave/ Total number of worker unable to return)	This metric seeks to measure how many workers are able to return back to work verses how many were not. The aim is to assess whether existing practices foster early return to work, although the length of absence can also be an indication of the severity of injuries. The length of time has economic consequences for the organization so the shorter the time, the lesser the economic impact in productivity and replacements.	Return to Work, Case management, Worker Retention, Program Evaluation
DM5	Percentage of workers who returned back to work.	(Total Number of workers who returned from injury leave /Total Number of injuries that resulted (required) in days away, modified or restricted work) *100	This metric seeks to measure how many of the injured employees were able to actually return back to the organization either in the same capacity of an alternative capacity. One of the most effective tools in disability management is a strong return-to-work program. By bringing disabled employees quickly and safely back to work, employers can greatly minimize the costs of disability. The higher the percentage the higher the level of performance in regards to accommodations for injured workers.	Return to Work, Case management, Program Evaluation
DM6	Percentage of injuries that required case management.	(Total number of injuries that required case management/Total	This metric seeks to measure the number of injuries that required case management. One of the	Return to Work, Case management, Program

		number of injuries) *100	main aims of DM is to support injured workers on a case-by-case basis. This metric seeks to measure how often this is conducted per the number of injuries. The relevance being, by measuring how many injured require case management, measures can be put in place to sure workers get the needed accommodations.	Evaluation
DM7	Percentage of workers off due to injury.	(Total number of workers off due to injury/ Total number of injuries) *100	This metric seeks to measure the number of workers who took a leave of absence due to injuries in the workplace. The relevance being, by measuring this, organizations can track how many workers are off due to injury and then put necessary measures in place to ensure the full integration if these workers back into the workplace.	Return to Work, Case management, Program Evaluation
DM8	The cost of claims against the number of claims.	Cost of Claim/Number of Claims	This metric seeks to measure the average claim payment for a period of time.	Claims Management, Program Evaluation
DM9	Percentage of workers who were placed on modified work.	(Total number of workers placed on modified duties / Number of injuries that results (required) in days away, modified or restricted work)*100	This metric seeks to measure the effectiveness and success rate of implementing the modified work program. Equally important are processes that help keep workers on the job once they are returned to the work force. Transitional work assignments are both possible and necessary in a good disability management program. The goal is to move employees as appropriate from part-time or transitional work to full-time employment, as they	Transitional program, Program Evaluation,

			are recovering and able to take on more responsibilities. The higher the percentage the higher the level of integration and thus performance.	
DM10	Percentage of workers who transitioned from temporary work to their original work.	(Total number of workers who transitioned from temporary work to their original work / Total number workers placed on transitional work) *100	This metric seeks to measure the commitment of the organization to DM and willingness to learn and improve on current practices. By tracking the number of workers who successfully transitioned from their modified work to their original work, organizations are able to assess the transition rate and how to better accommodate workers.	Transitional program, Program Evaluation
DM11	Percentage of injured workers who were provided with physical accommodation.	(Total number of injured workers who were provided with physical accommodation/ Total number of injured workers required physical accommodation)*100	This metric seeks to measure how many workers who required physical accommodation were actually accommodated. The higher the percentage the higher the level of accommodation.	Physical accommodation, Program Evaluation
DM12	Percentage of job designed to reduce heavy lifting and repetitive movement.	(Total number of jobs designed to reduce heavy lifting and repetitive movement/ Total number of jobs)*100	This metric seeks to measure number of jobs designed according to ergonomic principles. Ideally organizations should introduce prevention programs that assess the risk of disability in the workplace and put in place interventions to eliminate or minimise this risk (Habeck and Hunt, 1999).	Ergonomics and Disability injury prevention, Program Evaluation
DM13	Percentage of new tools, equipment, or furniture purchased considering ergonomic factors.	(Total number of new tools, equipment, or furniture purchased considering ergonomic factors/ Total number of new tools, equipment, or	This metric seeks to measure the number of new tools and equipment purchased considering ergonomic factors. Research shows that implementing an	Ergonomics and Disability injury prevention, Program Evaluation

	furniture bought) *100	ergonomic intervention program decreases work-related health costs.	

Noticeably absent are performance metrics measuring regulatory and compliance policies, recruitment practices and senior management support. This is because these indicators and their inherent practices are qualitative and subjective in nature and thus cannot be easily tracked numerically.

3.5.2 Metrics Implementation

The research aimed to apply all of the safety and DM metrics defined in the previous subsection to the sample of companies recruited as part of the third objective. Of the ten companies that participated in the research, only eight agreed to participate in this metrics implementation phase. Those companies are shown in Table 9.

Table 9: Company Breakdown: Safety and DM Metrics Implementation

Company	Area of Operation	Number of Employees	Size	Annual Revenue (in millions of $)
Company 1	Building	<100	Medium	15.66
Company 2	Building/Civil	0-100	Small	12.5
Company 3	Building	0-100	Small	2.66
Company 4	Building	0-100	Small	4.67
Company 5	Building/Civil	0-100	Small	13.3
Company 6	Building	0-100	Small	2.54
Company 7	Building/ Non-Residential	0-100	Small	6.88
Company 8	Building/Non-Residential	<100	Medium	13.8

To collect the safety and DM data that would enable the calculation of those metrics, the Excel

worksheet shown in Appendix J was developed and sent out to these eight companies. Safety and DM data was collected on a monthly basis from 2012 to 2015 for each of those companies to enable performance to be assessed over that four-year time period. Although the intent was to collect all of the data shown in Appendix J, realistically, most companies only tracked a few of them, thereby limiting the number of metrics that could be applied as part of this research. Moreover, although utmost confidentiality was assured, most companies were hesitant to provide data such as the cost of claims. The DM data was the most difficult to collect given that only four of the eight evaluated companies tracked it. Due to this limitation, only 5 out of the 13 developed DM metrics could be applied and thus empirically measured.

3.5.3 Data Analysis

Descriptive analytical techniques such as line graphs were used to analyze the safety and DM metrics and evaluate specific trends related to them. Graphs were also used to highlight trends in companies' safety and DM performance. The graphs for the safety metrics: RIR, SR and LTCR were derived using the formulas in Table 7, and respective values were plotted for each of the eight companies. The correlation between the three metrics was analyzed using Spearman's non-parametric correlation test due to the small sample size.

The five DM metrics: DM5, DM6, DM7, DM9 and DM10 for which data was collected for four out of the eight companies was also analyzed. In the same way, graphs for these DM metrics were derived using the formulas in Table 8, and respective values were plotted for each of the four companies. Finally, the relationship between DM performance metrics and safety performance

metrics was assessed using Spearman's non-parametric correlation test to investigate whether any correlation existed between them. The analysis also aimed to investigate whether companies with better DM performance had a higher safety performance record and vice-versa.

3.6 Objective #5: Evaluating Construction Organizations' Disability Management and Safety Performance

This objective involved evaluating the relationship between companies' leading indicators of performance as evidenced by their maturity model scores (i.e. Objective #3) and their lagging indicators of performance as evidenced by their safety and DM metrics (i.e. Objective #4). Therefore, the research relied on using the maturity modelling data stemming from the achievement of objective #3 and the DM and safety metrics stemming from the achievement of objective #4. The research involved using a combination of bar charts and lines to depict that relationship graphically instead of using of more rigorous statistical analysis due to the small sample size of the companies evaluated. A combination of box plots and line graphs were also used to analyze the relationship between companies' overall DM maturity and their safety performance. Furthermore, Spearman's non-parametric correlation test was used to assess the relationship between the maturity of companies' individual DM indicators and the three safety metrics. Additionally, the relationship between the maturity of the individual indicators was also analyzed using Spearman's non-parametric correlation test.

3.7 Objective #6: Making Recommendations to Improve

Construction Organizations' Disability Management Performance

The research involved developing recommendations to improve the DM performance of the construction industry based on the findings of the research as a whole. These recommendations provide guidance to those looking to implement DM by helping them assess current practices, compare them to best practices and identify opportunities for DM performance improvement, thus bringing positive change to employees and organizations that need it most.

CHAPTER 4: RESULTS & DISCUSSION

This chapter presents the results of the research and provides a discussion of them in the context of the literature. The results are divided per research objective, with every section presenting the results stemming from achieving one of the six research objectives. The first section focuses on the results of surveying 88 construction organizations in Manitoba about the status of DM in the industry. The second centers on the results of the AHP conducted to weigh the 12 DM indicators making up the CDM3. The third section describes the results of applying the CDM3 to evaluate the maturity of ten construction companies in Manitoba whereas the fourth presents the results of using three safety metrics and five DM metrics to evaluate the safety and DM performance of these companies. The fifth section describes the potential relationships relating companies' overall DM maturity and their maturity with respect to every single DM indicator to their DM and safety performance, as measured using the metrics. The sixth and final section provides recommendations to improve the maturity of construction organizations' DM practices based on the best practices inherent in the CDM3.

4.1 Objective #1: Evaluating Status of Disability Management in Manitoban Construction Industry

This section presents the results of the detailed analysis of all survey responses and a discussion of these results within the wider context of the literature. The results and discussion will focus on the demographics of the sample surveyed, the employment status of workers disabled as a result of a workplace injury, and the specific disabilities accommodated by responding construction

organizations. The results and discussion will also focus on the implementation of DM programs in the industry, including the rationale behind implementing them, barriers to their implementation and the practices, accommodations and resources used as part of them, and their perception of the literature results.

4.1.1 Demographics

Of the 88 responding organizations, approximately, 43% were trade contractors and 34% were general contractors. Approximately, 56% of respondents identified themselves as health and safety managers or representatives. Owners and senior managers represented 31% of all respondents. Approximately, 77% of them were in organizations with less than 25 employees. This is not unexpected given how owners and senior managers tend to be the ones directly responsible for health and safety in small organizations. Only 3% of respondents were RTW coordinators or RTW representatives, and belonged to medium-sized organizations with 100 or more employees, reflecting a tendency for larger organizations to hire RTW representatives that are independent from their health and safety representatives. The majority of responding organizations (80%) were COR certified.

4.1.2 Employment of Disabled Workers

The analysis of survey responses showed how a large portion of responding organizations (47%) did not employ workers disabled as a result of a workplace injury. Approximately, 32% had less than 1% of these workers within their workforce. Only 4% employed 5% or more disabled workers. Statistically, only a moderate, statistically significant correlation ($r = 0.359$, $p = 0.003$) was found between the total number of workers in an organization and the percentage of returning

disabled workers employed in each. The research slightly adapted the definitions set by Industry Canada (2014) for the size of construction organizations, with organizations with less than 100 employees considered small, the ones employing between 100 and less than 500 employees considered medium, and the ones with 500 employees or more considered large. Given the size of the Manitoban market, a distinction was made between organizations with less than 25 employees, those with 25 but less than 50 employees, and those with 50 but less than 100 employees. Organizations with less than 25 employees had 0.82% disabled workers, those with 25 to less than 50 employees had 0.96% disabled workers and those with 50 to less than 100 employees had 1% disabled workers as a result of workplace injury. Middle-size and large organizations respectively employed 1.27% and 2% disabled workers. While these results show that larger organizations in the sample tend to have slightly more disabled workers returning to the workplace than smaller ones, the differences in the percentages of disabled workers employed by organizations of different sizes are very small and statistically insignificant. The expectation was that larger organizations would employ a lot more disabled workers because of their ability to accommodate them more easily than smaller ones.

Electrical and trade contractors employed the smallest percentage of disabled workers at 0.57% and 0.67% respectively, with general and mechanical contractors employing a slightly higher percentage of disabled workers at 1.37% and 2.50% respectively. The Kruskal-Wallis (KW) test showed no statistically significant difference in any of these values. With respect to the employment of disabled workers by type of work, organizations doing residential work in the sample were found surprisingly to employ only 0.44% disabled workers whereas organizations doing commercial work employed more disabled workers at 1.04%. This could be due to the

smaller size of organizations doing residential work and the fewer work opportunities available to their disabled workers in comparison with organizations doing commercial work. Those doing industrial work were found to employ only 0.54% disabled workers whereas heavy and civil construction organizations employed 3.75% disabled workers: the largest percentage of all. Interestingly, statistically significant differences ($H(4) = 13.760$, $p = 0.008$) were found in these percentages, with the Dunn's Bonferroni post hoc test revealing a statistically significant difference ($p = 0.023$) between the 3.80% disabled workers employed by heavy or civil work construction organizations, and the 0.54% employed by organizations doing industrial work. These results could be due to the very specialized and sophisticated nature of industrial projects that may make for more challenging physical and mental tasks and thus make it less accommodating to disabled workers than more mainstream heavy and civil construction projects. Heavy and civil construction organizations in the sample also employed on average 100 employees whereas organizations doing industrial work employed 67 employees on average, which may explain the larger number of disabled workers employed in the heavy and civil sector.

4.1.3 Disabilities Accommodated

Table 10 below summarizes respondents' ranking of the most common disabilities found in their organizations and incurred as a result of workplace injuries. Disabilities due to MSI were the most common in the organizations surveyed. This is not surprising since more than half of all time loss injuries in the construction industry are related to MSIs (Workplace Safety and Health Division of Manitoba & Workers Compensation Board of Manitoba 2007). Physical mobility and hearing impairments came in next, slightly lagging behind musculoskeletal disabilities. Seeing impairments as well as mental disabilities were less common with a large difference in ranking

between them and the more common ones.

Table 10: Ranking of Most Common Disabilities Found in Organizations

Ranks	Disabilities	Average Rankings*
1	Musculoskeletal	6.92
2	Physical (mobility impairment)	6.38
3	Hearing	6.27
4	Seeing	4.65
5	Mental / Psychological	4.48
6	Speaking	4.31
7	Disease (cancer, diabetes, etc…)	4.18
8	Other	2.38

*Based on rankings from 1 to 8 by responding organizations, with 1 being the least common disability found in every organization and 8 being the most common one

A more in-depth investigation of the disabilities accommodated by different types of organizations showed how disabilities due to MSI were the most prevalent in workers returning to work for electrical, general, mechanical, and trade contractors. This was followed by disabilities related to physical mobility, except for mechanical contractors who accommodated more people with mental disabilities. With respect to disabilities accommodated by organizations doing different types of work, the analysis showed how disability due to MSI was the most common in organizations doing residential and commercial work whereas hearing and physical mobility disabilities were the most common in industrial and heavy and civil construction organizations respectively. Disability due to MSI was found to be the third most common disability in industrial and heavy/ civil construction organizations. The results of the KW test showed no statistically significant differences between the disabilities accommodated by different types of organizations or organizations doing different types of work. This could be due to the fact that construction projects whether industrial, residential, commercial or heavy projects require a minimum amount of physical and mental abilities regardless of the nature of the project. While some projects may require more abilities

than others, the differences are so subtle that they do not lead to drastically different results. A larger sample of organizations may uncover different results. Future research should investigate why some disabilities tend to be more common than others.

4.1.4 Implementation of Disability Management Programs

Approximately, 62% of responding organizations implemented a DM program: a level of implementation that reflects an unexpected awareness of the importance of DM programs at the local level among organizations in the sample. This percentage can also be due to sampling bias that may make organizations with a DM program more likely to respond to the questionnaire than ones without one, highlighting the need for research that would avoid this bias. Even though the results of the SRCC test showed a weak, non-statistically significant correlation between COR certification of construction organizations and their implementation of a DM program, 67% of COR-certified organizations in the sample were found to implement a DM program. This reflects a tendency for organizations with an effective health and safety program in the sample to implement a DM program. This is not surprising given the expectation that organizations with an effective health and safety program would be more likely to have a DM program than organizations without one.

4.1.5 Rationale behind Implementation of Disability Management Programs

An overwhelming majority of respondents (89%) in the sample agreed that construction organizations should develop and implement a DM program. Approximately, 81% of responding

organizations that did not have a DM agreed that construction organizations should have one. While those results reflect an awareness of the importance of DM programs among those organizations even when they are not implemented, they could also be the result of sampling bias that would make organizations with a vested interest in the subject more likely to complete the questionnaire than others. Approximately, 56% of total respondents in the sample saw retaining valued and experienced employees and maintaining employee morale as the main reason for doing so. Not surprisingly, smaller organizations with less than 50 employees ranked this reason higher than larger organizations with 50 or more employees. One respondent commented on how retaining workers helped workers feel valued by themselves, their family members and their employers. The second reason perceived by respondents in the sample for why construction organizations should develop and implement a DM program was to reduce costs related to claims, insurance premiums, hiring and training, with larger organizations (100 or more employees) ranking this higher than smaller ones. This is not surprising given how reducing costs is always a priority to construction employers. The two lowest ranked reasons were to comply with existing legislation and enhance an organization's image. Not surprisingly, large organizations with 500 or more employees ranked the need to comply with existing legislation higher than smaller ones. Table 11 summarizes these rankings. Even though 89% of respondents believed that construction organizations should have a DM program, only 62% actually implemented them, indicating a discrepancy that requires further investigation.

Table 11: Ranking of Reasons why Organizations should have a Disability Management Program

Ranks	Reasons	Average Rankings*
1	To retain valued and experienced employees and maintain employee morale	4.31
2	To reduce costs (e.g. claims, premiums, hiring and training)	3.75
3	To comply with existing legislation	3.42
4	To enhance organization's image	2.40

*Based on rankings from 1 to 5 by responding organizations, with 1 being the least important reason identified by every organization and 5 being the most important one. The average ranking of the fifth reason: "Other" is not shown in the table.

4.1.6 Barriers to Implementation of Disability Management Programs

Table 12 shows respondents' ranking of the barriers to the successful return of disabled workers following a work injury. Interestingly, the lack of suitable modified or alternate work was found to be the most important barrier. This is not surprising given the physical nature of construction work and thus the limited opportunities for modified or alternate should a physical injury leading to a permanent physical disability occur. One respondent commented on how construction organizations will accommodate injured workers as long as they can do so and that the level of accommodation depended on the seriousness of the injuries sustained. Smaller organizations with less than 50 employees found the lack of suitable modified or alternate work to be more problematic than larger organizations with 50 or employees.

Table 12: Ranking of Barriers to the Return of Disabled Employees back to Work: Statistical Analysis Results

Ranks	Barriers	Average Rankings
1	Lack of suitable alternative work	4.31
2	Disabled employees motivation	3.74
3	Difficulty of communicating with other key parties	2.89
4	Cost of accommodation	2.74

*Based on rankings from 1 to 5 by responding organizations, with 1 being the least important barrier identified by every organization and 5 being the most important one. The average ranking of the fifth barrier: "Other" is not shown in the table.

Disabled employees' motivation was identified as the second most important barrier by the sample of employers surveyed. While this may apply to a larger population of construction employers, it is important to remember that these rankings reflect the subjective opinions of the employers surveyed. Employers may have a tendency to hold workers responsible for not returning once disabled and thus see employee motivation as the main problem. A survey administered to workers themselves may see workers shifting the responsibility to employers and thus lead to very different results.

The cost of accommodation was found to be the least important barrier of all. This agrees with Soklaridis et al. (2011) but contradicts Lingard and Saunders (2004) and Kochan et al. (2003) who found cost to be one of the most important barriers to employing disabled or injured workers. This result could also be due to construction employers not wanting to be seen as unwilling to invest in costly accommodations. Although large organizations with 500 or more employees found the cost of accommodation to be more problematic than other smaller organizations, they found cost to be a more important reason for wanting to implement a DM program than smaller organizations.

An investigation of the barriers ranked by organizations implementing a DM program and those

that did not implement one shows no difference in the ranking of the barriers proposed. Moreover, the average rankings of every barrier by each of those two categories of organizations are very similar, except for the ranking of the lack of suitable alternate work, and difficulty of communicating with other key parties. Organizations without a DM program found the lack of suitable alternate work to be more problematic than organizations with a DM program, most likely because of how DM programs help define and identify suitable alternate work for disabled workers. Organizations with a DM program found it more difficult on average to communicate with other key parties than organizations without a DM program. This could be due to the communication structure and requirements stipulated by DM programs that may complicate how workplace injuries and return to work cases are communicated and dealt with.

4.1.7 Practices Implemented as Part of Disability Management Programs

Responding organizations with a DM program in place were asked to identify practices used as part of their programs. Approximately, 92% provided modified or alternate work opportunities to their workers, with all organizations with 25 or more employees providing these opportunities to their workers. This is despite 45% of organizations providing such work identifying suitable modified or alternate work as the most important barrier to the successful return of disabled workers to the workplace. These somewhat contradictory results may be reflecting the difficulty construction organizations have with providing suitable modified or alternate work that takes real advantage of these workers' skills and abilities. Approximately, 64% developed customized RTW plans for disabled workers returning to the workplace. This could be due to the limited opportunities for modified or alternate work available to them upon their return that may warrant

customized plans. Organizations with 50 or more employees developed these plans more often than smaller ones. Only 58% and 56% of all responding organizations developed clear RTW procedures and trained employees on existing programs respectively, with larger organizations (with 50 or more employees) doing this more often than smaller ones. Only 22% hired a RTW coordinator or established a RTW committee: a result hardly surprising given how the industry predominantly comprises small and medium sized organizations that cannot justify the cost of such investments. The low rate of employment of disabled workers returning to the workplace may also make organizations feel like such investments in personnel are not warranted. The gap in the rate of implementation of that specific practice between small and large organizations was the highest with that rate averaging 63% for larger organizations with 50 or more employees, and 11% for smaller ones. Figure 5 shows the percentage of organizations implementing each practice.

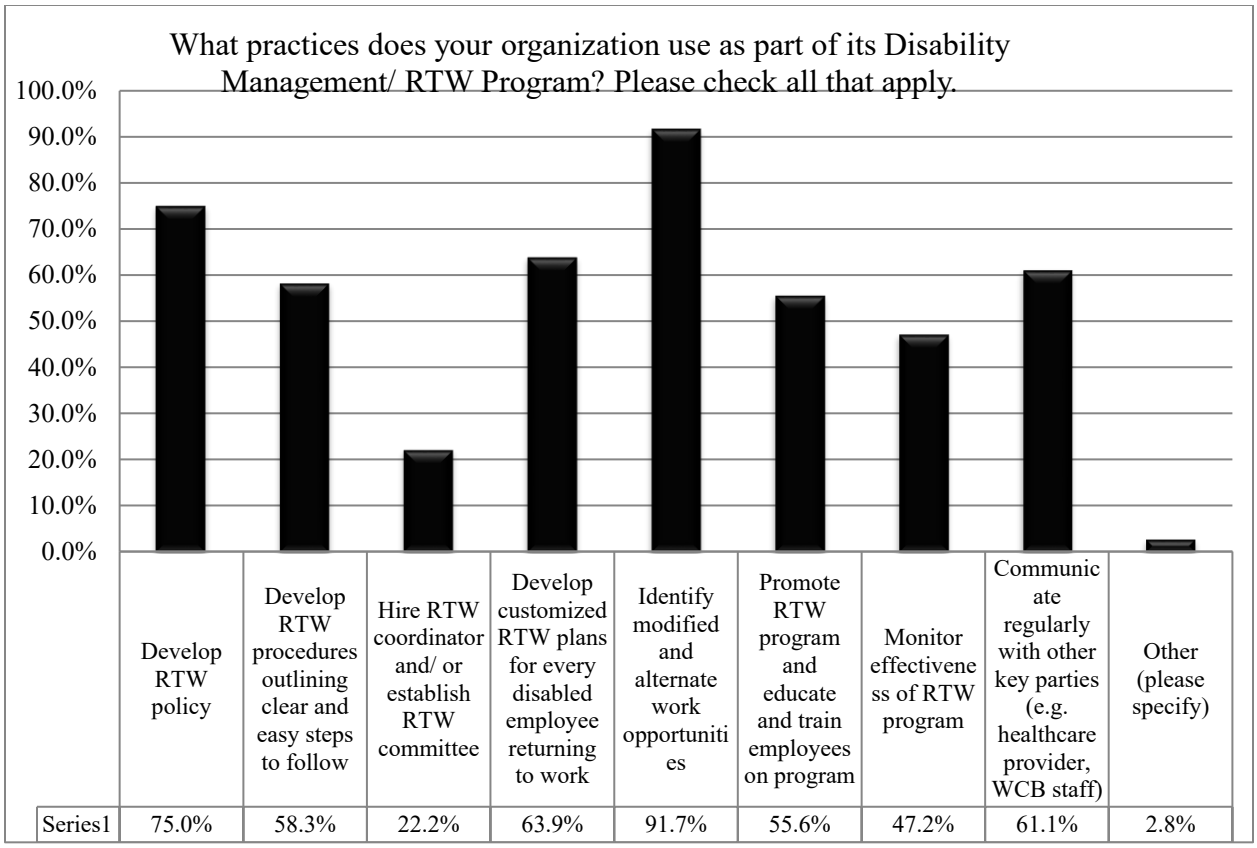

Figure 5: Practices Used by Organizations as part of their Disability Management Programs

4.1.8 Accommodations Provided as Part of Disability Management Programs

When asked about the specific accommodations provided to returning disabled workers, 94% and 83% of responding organizations chose “modified/ alternate work” and “modified hours/ days” respectively, with no differences in average responses between smaller and larger organizations. These results are in line with the practices identified by responding organizations as part of their DM programs. Only 33% of responding organizations provided accessible workstations, with 78% of organizations with 100 or more employees providing those in comparison to 19% of the smaller ones. Moreover, only 31% offered accessible washrooms, with 56% of organizations with 100 or

more employees offering those in comparison to 23% of the smaller ones. Only 11% provided handrails and ramps and a mere 6% offered accessible elevators. All of these organizations were ones with 50 or more employees, most probably due to the high cost of such accommodations. These results raise concerns about the cost of some accommodations and the ability of smaller organizations to provide them in comparison with larger ones. Figure 6 depicts the percentage of organizations providing each type of accommodation.

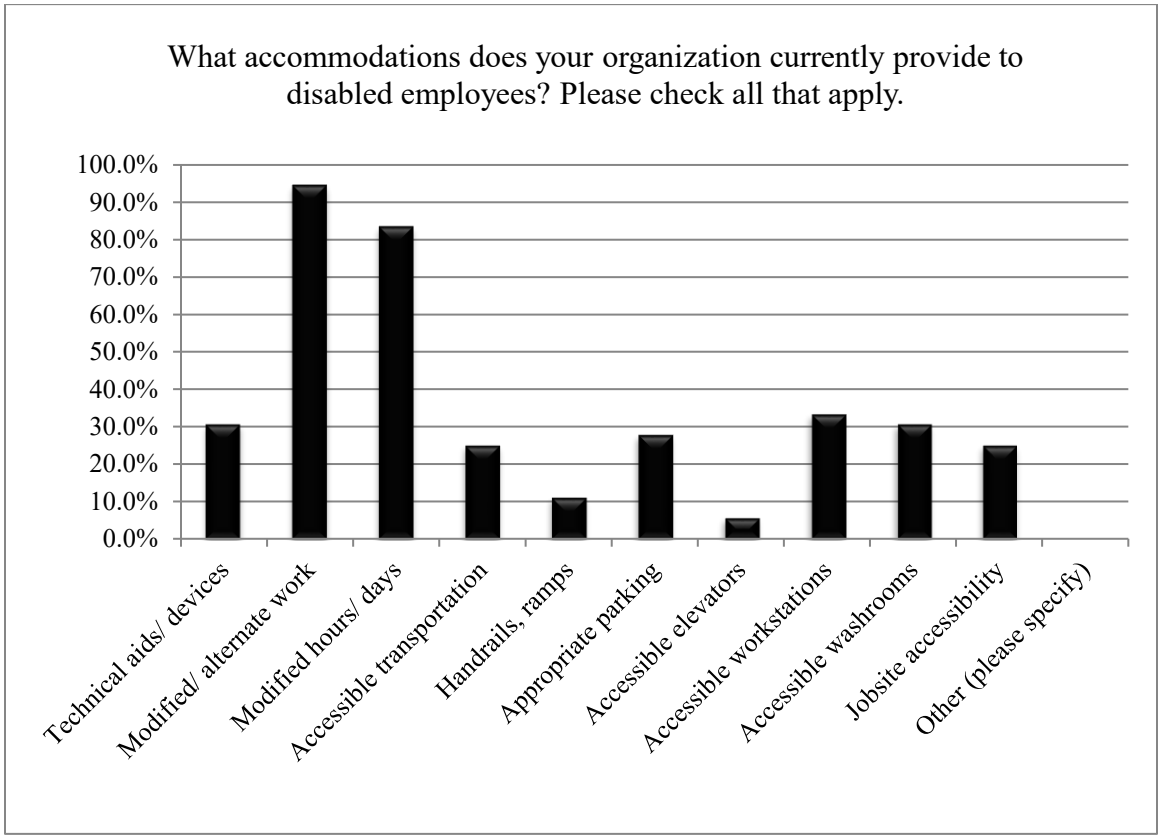

Figure 6: Accommodations Provided by Organizations to Disabled Employees as Part of their Disability Management Programs

4.1.9 Resources Used as Part of Disability Management Programs

Approximately, 80% of responding organizations with a DM program were aware that the WCB

can assist them with the planning, coordination and monitoring of their DM programs. All organizations with 100 or more employees were aware of the WCB's role in comparison to 74% of the companies with less than 100 employees, reflecting a higher level of awareness among larger companies. Table 13 and 14 summarizes the results of their ranking of resources available at their disposal to develop or improve DM programs in terms of their importance. Most organizations seemed to rely on their own internal staff to develop or improve DM programs followed by the WCB. Respondents seemed to communicate frequently with healthcare providers, but less with union representatives, perhaps because of the traditional tense relationship between construction employers and labour unions. Nevertheless, larger organizations seemed to rely more on labour unions than smaller ones, identifying it as the second most important resource after WCB staff. This may be due to the tendency for larger organizations to employ unionized workers in comparison to smaller ones.

Table 13: Practices Used by Organizations as part of their Disability Management Programs

Practices	Responses
Identify modified and alternate work opportunities	92%
Develop RTW policy	75%
Develop customized RTW plans for every disabled employee returning to work	64%
Communicate regularly with other key parties (e.g. healthcare provider, WCB staff)	61%
Develop RTW procedures outlining clear and easy steps to follow	58%
Promote DM program and educate and train employees on program	56%
Monitor effectiveness of DM program	47%
Hire RTW coordinator and/or establish RTW committee	22%

Table 14: Ranking of Resources Used by Organizations to Develop or Improve their Disability Management Programs

Ranks	Resources	Average Rankings
1	Organization's RTW Coordinator/Committee	3.97
2	WCB staff	3.94
3	Healthcare Providers	3.66
4	Union Representatives	1.74
5	Other	1.69

*Based on rankings from 1 to 5 by responding organizations, with 1 being the least important resource identified by every organization and 5 being the most important one.

4.1.10 Disability Management Financial Incentives

A number of financial incentives are available at the federal and provincial levels in Canada for organizations looking to improve accessibility (e.g. Enabling Accessibility Fund and Social Development Fund through Employment and Social Development Canada) (Employment and Social Development Canada 2014). Approximately 60% of respondents agreed that such incentives would encourage their organizations to develop or improve their DM programs. The SRCC test conducted to evaluate the relationship between how construction organizations perceive financial incentives at the federal and provincial levels and whether these organizations had an actual DM program in place showed no statistically significant relationship between these two aspects. Approximately, 70% of responding organizations without a DM program versus 71% of those with one felt that financial incentives would encourage them to develop or improve their own DM programs respectively.

4.2 Objective #2: Developing and Validating Disability

Management Indicators for Construction Organizations

The AHP evaluation showed that the consistency ratios for all the pairwise comparison matrixes were within the acceptable range of 0.0325 to 0.077. The overall consistency ratio equalled 0.0534 which was below the acceptable maximum of 0.10, indicating that the judgements of the experts were consistent and thus reliable. Table 15 below presents the resulting weights of importance and rankings of the different indicators whereas the next three subsections include discussions of the six highest ranked indicators, the six lowest ranked indicators and organizational and individual level indicators. The discussion is conducted within the context of the broader literature.

Table 15: Ranking and Weights of Proposed DM Indicators

Rank	Indicator	Category	Final Weights of Importance
1	Return to Work Practices	Individual	0.157
2	Disability and Injury Prevention Practices	Organizational	0.138
3	Senior Management Support Practices	Organizational	0.136
4	Transitional Program Management Practices	Organizational	0.100
5	Regulatory and Compliance Policies	Organizational	0.098
6	Program Evaluation Practices	Organizational	0.084
7	Recruitment and Retention Policies	Organizational	0.058
8	Ergonomic Practices	Organizational	0.053
9	Communication Practices	Individual	0.052
10	Case Management Practices	Individual	0.045
11	Claims Management Practices	Individual	0.040
12	Physical Accessibility Management Practices	Organizational	0.038
		∑weight	1

4.2.1 Highest Ranked Indicators

Table 16 above shows that the highest ranked DM indicator in Manitoba: “Return to work practices” was deemed 4.5 times more important than the lowest ranked: “Physical Accessibility practices”. These results were in line with the industry survey presented in section 4.1 which had

found that the three most implemented practices by construction organizations in Manitoba included: providing disabled workers with modified or alternate work opportunities, developing a RTW policy and developing customized RTW plans for these workers. This was also in line with earlier work conducted by Lingard and Saunders, (2004) and Newton and Omerod (2005) which had found RTW to be the dominant determinate of DM in construction workplaces. Krause et al. (1998) had also shown that modified work can cut in half the time needed for workers to RTW and double the likelihood of their return following an injury.

"Disability and injury prevention practices" ranked as the second most critical indicator: a reflection of the importance of health and safety management within the Manitoba construction industry and of the consequent tightening of regulations at the provincial level (WCB 2013). The survey results in section 4.1 had also shown that 67% of organizations that had implemented an accredited occupational health and safety program (i.e. a Certificate of Recognition program) implemented a DM program, further confirming the potential link between health and safety and DM. This ranking is also in cognisance with the literature which considers preventative practices as successful pillars of DM programs and the most effective at reducing the risk of work injuries and related claims and leaves (Akabas et al. 1992, Angeloni 2013, Lingard and Saunder 2004). Despite the importance of these preventative practices, musculoskeletal (MSI) injuries were found to be the most common type of injury in Manitoba in section 4.1, calling into question the effectiveness of these practices for MSI injuries in particular.

Discussions with the experts during the AHP pointed to the critical role of "Senior management support" which explains its ranking as the third most important DM indicator, with a weight of

0.136. This is in line with earlier works by Habeck & Hunt (1999), Shrey & Olsheski (1992), Lingard and Saunder (2004) and Shrey (1995) who had agreed that management support of workers is a critical determinant of rehabilitation, return to work and overall program success. The ranking of this indicator was below that of "Disability and injury prevention practices" by only 0.02, reflecting the equal importance of these two indicators and the need for construction organizations to consider them concurrently to improve and revamp their DM programs.

"Transitional program management practices" which aim to provide generic DM programs for injured workers that will be customized to individual workers during case management came in next as the 4th most important indicator. This is not surprising given that the survey results in section 4.1 showed that 92% of surveyed organizations with a DM program in Manitoba provided modified or alternate work opportunities whereas only 62% customized their RTW plans to individual workers.

"Regulatory and compliance practices" were found to be the 5th most critical indicator of the 12 indicators considered. This indicator was 2.6 times more important than the least important indicator: "Physical accessibility management" practices, yet 1.6 times less important than the highest ranked indicator: "Return to work practices". This ranking may reflect a modest level of awareness of DM legislation and its importance within the Manitoban construction industry. It may also reflect inadequate DM legislation and enforcement of that legislation in the Manitoban context. It is in line with the survey results in section 4.1 where surveyed organizations were given four potential reasons for why they should have a DM program and asked to rank them in terms of their importance. Of the four reasons provided, these organizations ranked the need to comply

with existing legislation as the third most important. It is also in line with results by Newton and Ormerod (2005) and Smallwood and Haupt (2008) showing that construction organizations had little to no formal practices to support disability in place, with some finding compliance with existing regulations costly with little return.

"Program evaluation practices" were ranked as the 6th most important indicator out of the 12 indicators investigated and were thus deemed as neither too important nor too insignificant by the AHP experts. These practices aim to assess and monitor the implementation of DM procedures, regulations and practices within the organization with the aim of improving them. Despite their relative significance in the literature (Robinson et al. 2014), the survey results had also found that only 47% of surveyed organizations monitored the effectiveness of their RTW programs, validating thus the results of the AHP and reinforcing the need to pay more attention to this aspect of DM.

4.2.2 Lowest Ranked Indicators

"Recruitment and retention practices" ranked 7th and were thus deemed as reasonably non-critical by the expert group. This is not surprising given that construction companies' recruitment and retention practices usually cover issues that apply to any employee rather than those that focus specifically on disability (Newton and Ormerod 2005). It is why 47% of the surveyed construction companies in section 4.1 did not employ any workers disabled as a result of workplace accident whereas 32% of them employed less than 1%. These companies also identified the lack of suitable modified or alternate work as the most important barrier to the return of disabled workers back to the workplace. This reinforces the need to place more emphasis on the provision of such work as

part of improving retention practices that would encourage the return of injured and disabled workers to the workplace.

Due to the laborious nature of construction, workers are more likely to suffer from pain in the neck, shoulders and low back and from muscular disorders (Johansson and Rubenowitz 1992, Johansson 1994). In fact, the survey in section 4.1 showed that disabilities due to MSI were the most common disability accommodated by construction organizations in Manitoba. This reinforces the need for ergonomic workplace designs that manage and mitigate some of these issues. Unfortunately, "Ergonomic practices", a relatively newer indicator in the DM literature ranked in 8th place only, reflecting its low importance to practitioners in the industry. This agrees with the survey results which showed that only 25 to 33% of surveyed organizations in Manitoba provided accommodations such as accessible workstations, washrooms and transportation to their workers. Despite their cost, these accessible workspaces can help workers return to their original jobs faster, taking the pressure off having to provide them with modified or alternate jobs.

"Communication practices" came in 9th place despite studies such as Brooker et al. (2012) and Westmorland et al. (2005) stressing the importance of communicating with workers to make them feel more valued and want to return to work faster. "Case management practices" also ranked as the 10th most important indicator despite case management being one of the main pillars of DM in the broader literature (Angeloni 2013). This ranking is in line with their ranking of "transitional program management practices" in 4th place and is reflective of the tendency of the Manitoban construction industry to focus on generic DM programs that do not always cater to the individual needs of disabled workers. It is also similar to the survey results in section 4.1 which had shown

that only 64% of organizations with a DM program customized their RTW plans to individual workers.

"Claims management practices" were also seen as unimportant as evidenced by their low ranking (i.e. 11th place). Nevertheless, this ranking was in line with the literature on DM in construction (e.g. Newton and Ormerod 2005, Lingard and Saunders 2004) which rarely took claims management into account when investigating DM. This is despite this same literature identifying cost as a key barrier to implementing DM, and the broader DM literature (e.g. Irving 2010) making the connection between effective claim management practices and decreased long-term costs. The surveyed construction organizations in Manitoba had also ranked reducing costs related to claims, insurance premiums, hiring and training as the second most important reason for why construction organizations should develop a DM program. This infers that although construction organizations recognize the long-term cost effectiveness of DM in general and of some practices such as claims management practices, they may still be unwilling to invest upfront in them, thus their lower importance to them.

"Physical accessibility management practices" was ranked as the least important indicator to DM performance. Despite their importance to managing disability in general (Newton et al. 2007), this ranking agreed with the survey results in section 4.1. The survey had shown that only 6 to 33% of surveyed organizations provided physical accommodations in the form of accessible workstations, technical aids and devices, accessible elevators, accessible workstations and accessible transportation, with larger organizations providing those more often than smaller ones. In contrast, 94% of these organizations provided modified or alternate work opportunities. This speaks of the

need to focus on improving the physical accessibility of the industry given its dynamic nature and ongoing physical challenges.

4.2.3 Ranking of Organizational and Individual-Level Indicators

Organization-level indicators were in general found to be more important to DM performance than individual-level ones. Five of the six highest ranked indicators were organizational whereas three of the four lowest ranked indicators were individual. This focus on organizational versus individual practices was in line with the results of the survey in section 4.1 which had showed that only a small proportion of responding organizations in Manitoba provided more extensive accommodations for workers requiring individualized accommodations. The construction industry in Manitoba appears therefore more likely to implement practices that target the overall organization than those that are tailored to specific individuals. This could be due to the cost and human resources associated with implementing these individual practices in comparison with organizational ones and the industry's reluctance to allocate that much money and personnel to manage disability as shown in section 4.1. Future research should therefore focus on investigating the cost of implementing these two different types of practices further. The higher ranking of organizational indicators can also be traced to the social model of disability, which according to Clark et al. (2009) is the dominant model adopted when managing disability in construction. The social model explains disability in social terms focusing on the ways in which the physical, cultural and social organization exclude or disadvantage disabled people (Pfeiffer 2001). It tends therefore to focus more on organizational practices, that is, altering the organization to integrate disabled persons. Future research would need to test these hypotheses further.

4.2.4 Relevance of Newly Developed Indicators

The developed and validated indicators provide a solid reference point in the emerging area of DM for the construction industry. By relying on evidence from the literature and expert input, the research hopes to bridge the gap between research and practice regarding DM. Establishing DM indicators ensures construction workplaces are mindful of the components and practices involved in preventing, managing and evaluating it. It also helps them determine the DM practices that should be implemented accordingly. This allows workers to be accurately diagnosed and have an appropriate RTW plan that allows access to evidence-based therapy, which is a key element to effective DM. Until now, construction workplaces had approached DM as part of health and safety management, however evidence from the DM literature shows that integrated DM goes beyond this. These indicators when implemented would not only protect employees from work hazards but also promote improvements in safe behaviour: an aspect often overlooked in tertiary prevention, thus the importance of proactive primary and secondary prevention (Angeloni 2013). The impact of implementing these DM indicators will likely include improved employee health and safety and improved employee morale and satisfaction.

4.3 Objective #3: Developing and Implementing Construction Disability Management Maturity Model

This section presents the results stemming from the analysis of the CDM3 assessment worksheet responses. The Cronbach's alpha (α) value for the assessment worksheet was 0.944, and was thus above the acceptable threshold of internal consistency and reliability threshold of 0.70. This analysis of the assessment responses focused on evaluating the maturity performance of the

participating companies and of their individual indicators. A sample case study analysis focusing on Company 1 in particular was also presented to demonstrate the CDM3's application to an individual company. These results were also discussed within the wider context of the literature.

4.3.1 Construction Companies' Maturity

The ten participating companies had an overall *average MS Company* of 4.06, with an *average PG Company* of 18.68% and were thus deemed to be performing at the quantitatively managed maturity level. Six of the ten companies were operating at the quantitatively managed level (i.e. with *MS Company* greater than or equal to 4 and below 5) as shown in Figure 7 and were thus efficient at implementing DM. Company 3 had the highest *MS Company* at 4.48 whereas Company 9 had the lowest *MS Company* at 3.52. Company 3 had the highest *MS Company w/AHP* at 4.44 whereas Company 9 had the lowest *MS Company w/AHP* at 3.40.

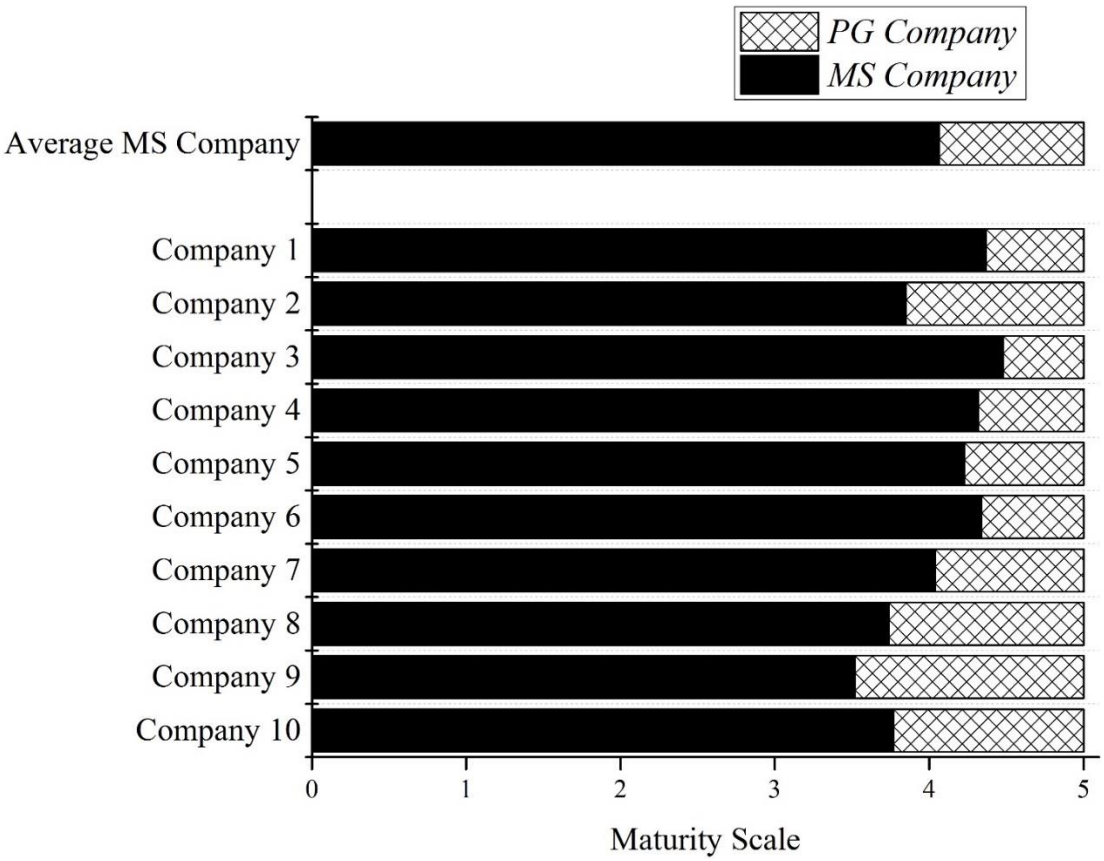

Figure 7: MS Company for Participating Companies

The three most mature companies were Companies 3, 1 and 6 and had *MS Company* of 4.48, 4.37 and 4.34 respectively. These three companies had relatively lower *MS Indicator* (i.e. greater than or equal to 3 and below 4) in the indicators with lower *AHP weights* such as "Physical Accessibility Management" which had an *AHP weight* of 0.038. "Senior Management Support", "Disability and Injury Prevention" and "Ergonomic" practices were the three most mature indicators within these three companies and had average *MS Indicator* of 4.92, 4.59 and 4.37 respectively. These indicators also had high *AHP weights*, indicating a high level of agreement between these companies and industry experts on the most critical indicators that affect DM performance. In contrast, the three least mature companies: Companies 9, 8 and 10 had *MS Company* of 3.52, 3.74 and 3.77 respectively. These companies had lower *MS Indicator* (i.e. greater than or equal to 3 and

below 4) in the indicators with higher *AHP weights* such as "Program Evaluation" which had an *AHP weight* of 0.084. "Program Evaluation" and "Ergonomic" practices were the least mature indicators within these three companies with *average MS Indicator* of 2.81 and 3.0 respectively even though they were highly ranked by the AHP experts. Because of this disconnect between the *MS Indicator* and their *AHP weights*, they resulted in low *MS Company*, reflecting low overall DM performance in these companies. An observation in companies with a *MS Company* below 4 (i.e. the standardized level), is that their least matured practices were those that were ranked highest by the AHP experts. These findings reinforce the need for construction companies to focus on improving the indicators that were ranked highest by the AHP experts to improve their overall maturity as much as possible. This is not to imply that other indicators should be ignored since the most mature companies tended to have high maturity (i.e. greater than or equal to 4) across the 12 indicators, reflecting consistently high performance throughout.

Figure 8 shows that the overall *MS Company* of 8 of 10 companies increased after considering *AHP weights*, which reflected a focus by these companies on implementing the most important indicators and practices identified by the expert group. The largest change between *MS Company w/o AHP* and *MS Company* (i.e. before and after considering AHP weights respectively) was detected in Company 5, where these values changed from 4.07 to 4.23 respectively. This showed this company was the most effective at targeting and implementing the most important practices such as "Return to Work". By contrast, these values decreased by 0.03 and 0.07 in Companies 7 and 2 once the *AHP weights* were applied. This is because these companies focused on implementing less important practices such as "Claims Management" which had an *AHP weight* of 0.040. These results reinforce the need to focus on determining the most important DM

indicators and practices and improving them as opposed to the less important ones to generate the largest improvements in DM performance. While the level of importance of these indicators was determined in this research by the expert group; in practice, they can be determined internally by every company or set at the industry level as benchmarks to be adopted by the wider industry.

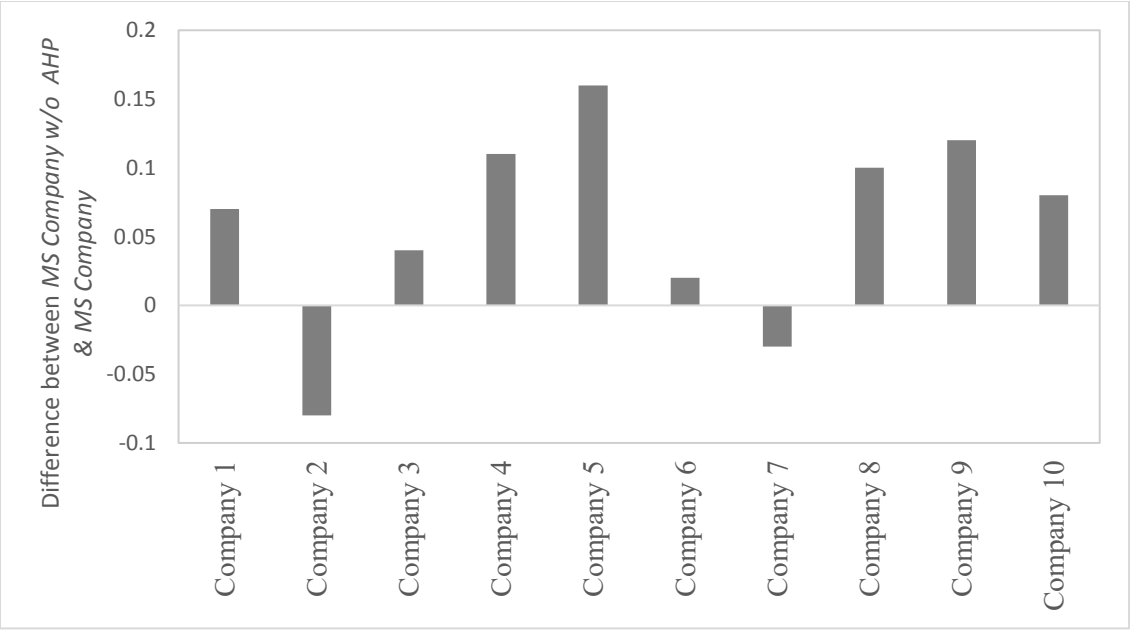

Figure 8: Difference between MS Company w/o AHP Values and MS Company Values for Participating Companies

An analysis of the *MS Company* of the 10 companies as a function of their size showed that small-sized companies tended to have higher *MS Company* than medium to large ones, with the most mature company (i.e. Company 3) being a small sized one. Within the sample, there were 4 small-sized companies performing at the quantitatively measured level with an *average MS Company* of 4.30, and 6 medium to large sized ones operating at the standardized level, with an average *MS Company* of 3.91. The three most mature companies: Companies 3, 6 and 1 were all small sized companies, whereas the two least mature ones, 8 and 9 were medium to large ones. While these

findings do not necessarily reflect the state of the Manitoban construction industry due to the size of the sample assessed, they contrast with the findings of the survey in section 4.1. According to the survey, smaller companies found it more difficult to provide DM accommodations than medium to larger ones. The latter group of companies also developed more customised RTW plans than the former. Therefore, the expectation was that larger companies would be more mature and thus better able to accommodate injured and disabled workers than smaller ones (Kenny 1999, Lingard and Saunders 2004). The fact that the smaller companies assessed were more mature could be due to the tendency for these companies to be family businesses and thus more in tune with the needs of their workers, providing them with more personalized care than larger ones. This result could also be due to sampling bias whereby the small companies assessed as part of this research were more mature on average than smaller companies within the industry at large and thus not representative of them. Therefore, their performance may have been uncharacteristically higher than that of small companies in general, which could also explain their willingness to participate in this research.

4.3.2 Maturity of key Indicators

Table 16 below shows the *AS Indicator %* for every indicator in every company, as well as the *average AS Indicator* % and the *average MS Indicator* for every indicator for the ten companies. As shown, some companies' indicators achieved full maturity (i.e. *AS Indicator %* = 100). However, when averaged, none of the indicators did (i.e. *average AS Indicator %* = 100). The *average PG Indicator* for these indicators ranged from 8% to 28.2%. "Senior Management Support" was found to be the most mature DM indicator on average across the 10 companies with an *average MS Indicator* of 4.60. This was followed by "Disability and Injury Prevention"

practices, with an *average MS Indicator* of 4.44. Only 5 of the 12 indicators were operating at the quantitatively measured level (i.e. *average MS Indicator* greater than or equal to 4 and below 5), with the remaining operating at the standardized level (i.e. *average MS Indicator* greater than or equal to 3 and below 4). The fact that all indicators were performing at a level 3 or higher is a positive indication of growth and shows that the companies assessed were aware of the practices that needed to be implemented and were taking proactive steps to implement them. While companies must continue paying attention to mature indicators with *MS Indicator* greater than or equal to 4, it is the less mature indicators with *MS Indicator* below 4 that will drive growth and need to be the focus of their attention. Those interviewed acknowledged that the model with its breakdown of DM practices helped them detect deficiencies within their DM programs and identify opportunities for improving them and by extension their DM performance. A few companies admitted that DM was a fairly new area for them despite acknowledging its importance.

Table 16: Maturity Scores for Key Indicators across Sampled Companies

AS Indicator %	CP	CMP	RAP	CLP	DIP	TPM	PAP	PEP	SMP	RCP	RRP	EP
Company 1	85.45	91.11	86.00	84.00	89.60	91.43	92.00	90.77	100.00	80.00	64.29	78.00
Company 2	70.91	87.78	72.00	88.00	82.40	78.57	76.00	81.54	70.00	72.00	77.14	86.00
Company 3	87.27	90.00	90.00	96.00	89.60	81.43	72.00	95.38	95.00	92.00	78.57	98.00
Company 4	89.09	84.44	88.00	84.00	91.20	80.00	72.00	86.15	100.00	84.00	68.57	84.00
Company 5	74.55	77.78	80.00	64.00	96.80	72.86	84.00	86.15	100.00	96.00	75.71	68.00
Company 6	58.18	92.22	76.00	92.00	96.00	78.57	100.00	90.77	100.00	92.00	75.71	86.00
Company 7	60.00	87.78	66.00	80.00	89.60	85.71	92.00	83.08	85.00	84.00	72.86	90.00
Company 8	76.36	80.00	74.00	64.00	82.40	71.43	74.00	66.92	85.00	80.00	63.57	57.00
Company 9	63.64	60.00	66.00	44.00	87.20	47.14	92.00	35.38	100.00	76.00	72.86	72.00
Company 10	76.36	81.11	74.00	66.00	82.40	72.86	76.00	66.15	85.00	80.00	68.57	56.00
Average *AS Indicator %*	74.18	83.22	77.2	76.2	88.72	76	83	78.23	92	83.6	71.79	77.5
Average *MS Indicator*	3.71	4.16	3.86	3.81	4.44	3.80	4.15	3.91	4.60	4.18	3.59	3.88

There also seems to be some commonality between the average maturity of the 12 indicators evaluated as determined by their *average MS Indicator* and their level of importance as determined by their *AHP weights* in section 4.2. "Senior Management Support" was found to be the most mature indicator (i.e. *average MS Indicator* = 4.60) and the third most important indicator (i.e. *AHP weight* = 0.136). "Recruitment and Retention" policies were found to be the least mature indicator (i.e. *average MS Indicator* = 3.59) and ranked seventh in terms of importance (i.e. *AHP weight* = 0.058). Nevertheless, although "Return to Work and Accommodation" was rated as the most important indicator (i.e. *AHP weight* = 0.058), it was one of the less mature indicators (i.e. *average MS Indicator* = 3.86), despite the literature defining RTW as the ultimate goal of DM (Shrey and Hursh 2001). Seven of the ten companies assessed identified the lack of DM training programs for supervisors and the lack of suitable job opportunities for disabled workers as key challenges to their RTW. This was also in line with the results of the survey which had identified the lack of suitable alternative work as the most important barrier to DM, reinforcing the need to improve these RTW practices.

4.3.3 Company 1 Case Study

Table 17 summarizes findings related to Company 1. Company 1 received an overall *MS Company w/AHP* of 4.30 and an *MS Company* of 4.37, making its *PG Company* 12.6%. The increase in the *MS Company* in comparison to the *MS Company w/AHP* indicates Company 1 placed emphasis on the indicators that were deemed more critical to overall DM, such as "Senior Management Support" which had an *AHP weight* of 0.136. Of significance is that "Return to Work" and "Disability and Injury Prevention" practices, which were assigned the highest AHP weights of 0.157 and 0.138 respectively had *MS Company* of 4.30 and 4.48 respectively. This is in line with

both Lingard and Saunders (2004) and Newton and Ormerod (2005) who had found RTW to be a dominant determinate of DM in construction workplaces. Nevertheless, these maturity scores also suggest room for improvement with respect to those two specific indicators. The least mature indicators: "Recruitment and Retention" policies and "Ergonomic" practices received *MS Company* of 3.21 and 3.90 respectively and ranked as the 7th and 8th most important indicators with *AHP weights* of 0.058 and 0.053 respectively. The maturity scores of these two indicators suggest that improving them will result in the greatest increase in the company's overall maturity. An investigation of the practices that were rated the lowest within each of those two indicators can help the company determine how best to improve their maturity. For instance, in looking at such practices within "Recruitment and Retention" policies, Company 1 would be advised to better 1) train their staff on issues involving equal opportunity, diversity and disability, 2) adopt alternative ways of testing for job skill requirements instead of relying on traditional job qualifications, 3) consider all possible accommodations that would best take advantage of disabled workers' skills and 4) provide occupational training opportunities for disabled workers unable to return to their original work.

Appendix K shows the anonymized individual report that was provided to this company. Similar reports reporting on the results of the application of the CDM3 to the participating companies and thus their various maturity levels were provided to each of the other nine companies in the sample.

Table 17: Summary of Company 1 Results

	COP	CMP	RAP	CLP	DIP	TPM	PAP	PEP	SMS	RCP	RRP	EP
AS Indicator	47	82	43	21	112	64	23	59	20	20	45	39
Optimal Score	55	90	50	25	125	70	25	65	20	25	70	50
AS Indicator (%)	85.45	91.11	86.00	84.00	89.60	91.43	92.00	90.77	100.00	80.00	64.29	78.00
MS Indicator	4.27	4.56	4.30	4.20	4.48	4.57	4.60	4.54	5.00	4.00	3.21	3.90
MS Company w/AHP	4.30											
MS Company	4.37											

4.4 Objective #4: Developing and Implementing Disability Management and Safety Metrics for Construction Organizations

This section presents the results related to measuring the safety and DM performance of the sampled companies using the safety and DM metrics developed for this research respectively. The safety performance results are presented first and followed by the DM performance results. The relationship between the safety and DM performance results is explored next before discussing the relevance and applicability of the newly developed DM metrics.

4.4.1 Safety Performance

Figures 9 and 10 present the recordable injury rates (RIR), severity rates (SR) and the lost time case rates (LTCR) for the eight evaluated companies per 100 workers over the four-year study period. The emergent trend is a gradual decline in RIR and LTCR over the four years whereas SR remained relatively high during the same period. The data suggests an increase in incident severity, resulting in a higher number of lost day incidents, with the number of incidents gradually declining. Six of the eight companies were small-sized with only two being medium-sized. The literature showed that smaller companies tended to have high incident rates, or incident rates that fluctuate significantly from year to year (OSHA, 2010). This is because of the small number of employees and hence the lower number of labor hours worked in these companies.

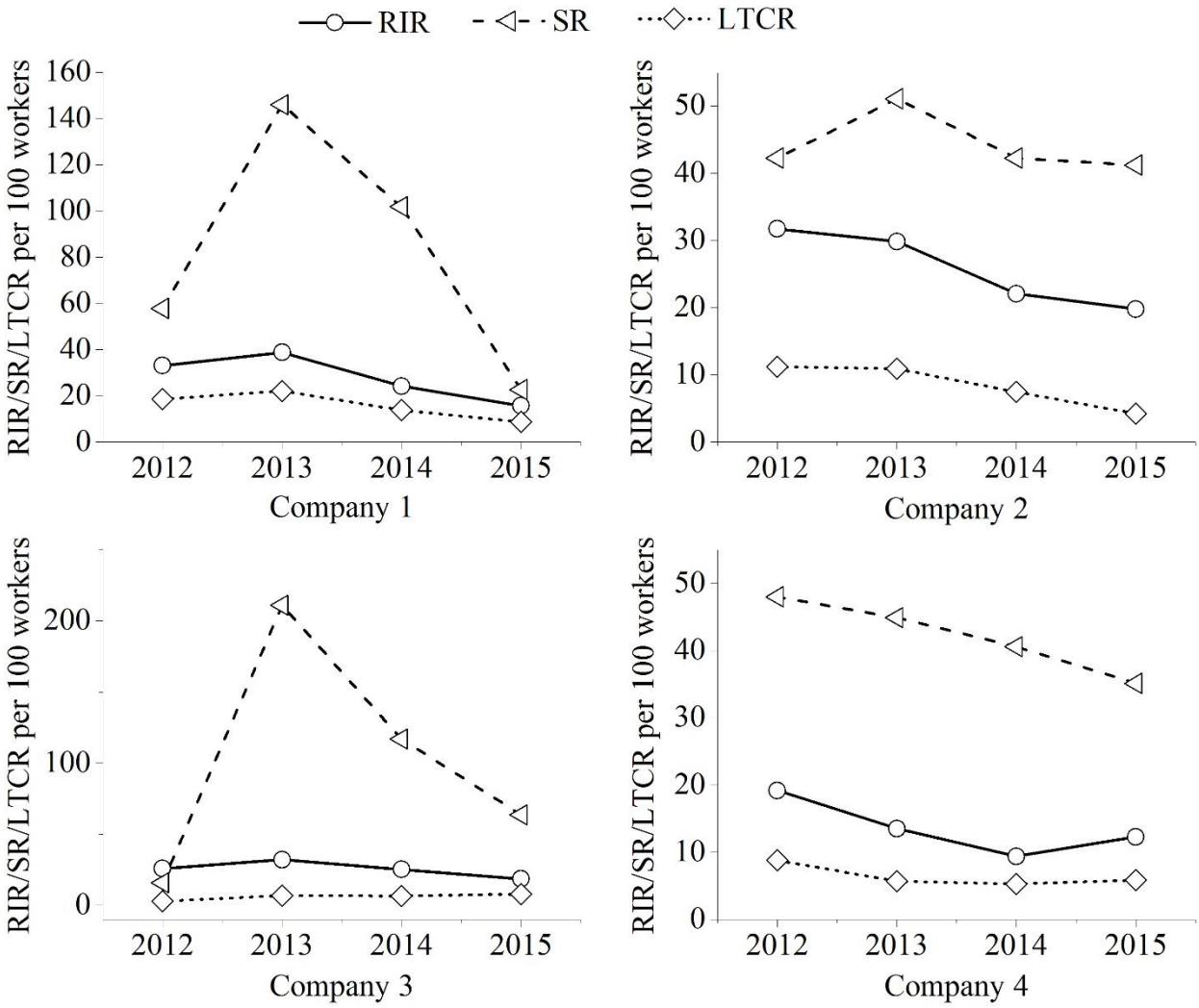

Figure 9: Safety Performance Trends (Company1-4)

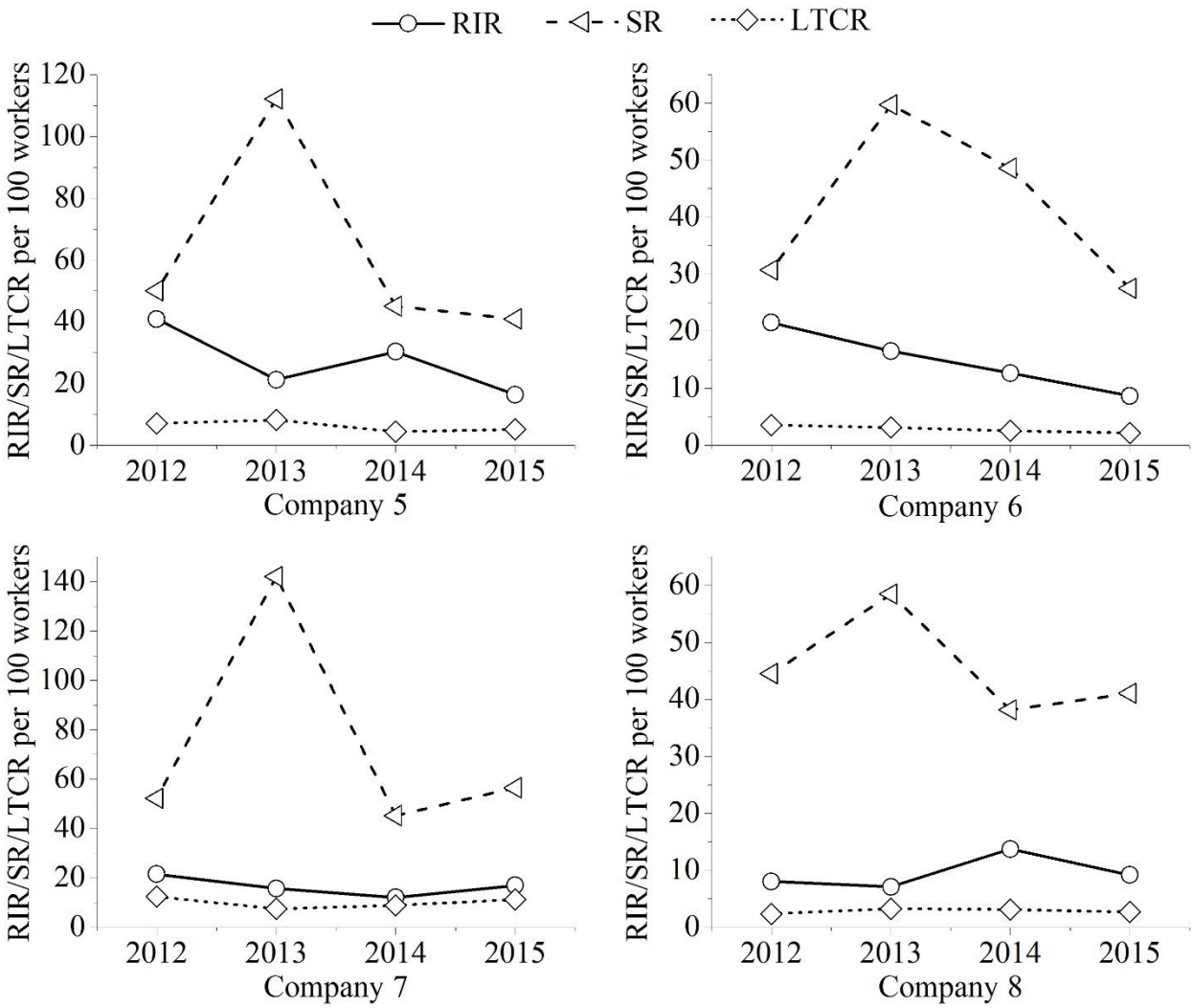

Figure 10: Safety Performance Trends (Company 5-8)

Figure 9 shows that Company 1's RIR decreased from 33.05 in 2012 to 15.66 incidents per 100 workers in 2015, with its SR increasing from 57.84 in 2012 to a high of 145.89 in 2013 and a low of 22.66 in 2015. This medium-sized company had the highest number of incidents resulting in lost days, with a LTCR of 18.59 in 2012 and a high of 22.16 in 2013. According to data published by the Manitoba Workplace Injury and Illness Statistics (2000-2013), the average LTCR for construction was 6.4 in 2012 and 5.5 in 2013. Therefore, the company's performance during those same periods was significantly below the industry average, with the company experiencing almost

three times as much LTCR in 2012 and 4 times as much in 2013. Likewise, Company 2 and Company 3, both small-sized saw a decline in their RIR from 31.7 incidents per 100 workers in 2012 to 19.77 in 2015, and from 25.9 incidents per 100 workers in 2012 to 18.51 in 2015 respectively. While Company 2's SR remained relatively the same from 42.25 in 2012 to 41.21 in 2015, Company 3 experienced the most fluctuations in its SR, with a high of 211.03 in 2013 and a low of 63.5 in 2015. This shows the severity of these injuries was very high during this period even though Company 3's LTCR was only 2.88 in 2012, 6.88 in 2013, 6.64 in 2014 and 7.93 in 2015. This demonstrates the danger of relying on one metric alone to determine safety performance, since a single metric captures only one aspect of performance and is not representative of the entire picture. Company 4 overall had consistently low RIR, SR and LTCR figures from 2012 to 2015. Its RIR ranged from 19.2 in 2012 to 12.3 in 2015, and a low of 9.41 incidents per 100 workers in 2013. The amount of lost days to incidents (i.e. SR) also decreased from a high of 48 in 2012 to a low of 35.14 in 2015. Although its LTCR of 8.8 in 2012 was above the Manitoba average, the rate improved significantly from 2013 to 2015, and went below 6 by 2015.

With respect to Companies 5 to 8 shown in Figure 10, Company 5 experienced an increase in safety performance as reflected by its RIR and LTCR over the four-year period. The number of incidents per 100 workers (i.e. RIR) decreased from 40.9 in 2012 to 16.42 in 2015, whereas its SR increased from 50.1 in 2012 to a high of 112.13 in 2013 before experiencing a decline to 40.91 in 2015. There was a large discrepancy between the company's SR and LTCR. For example, in 2013, although only 21.22 incidents were recorded per 100 workers (i.e. SR), Company 5 lost 112.13 days per 100 workers (i.e. LTCR) during that same period. Company 6 and Company 7 had very

similar low RIR, ranging between 21.5 in 2012 and 8.65 in 2015 for Company 6 and between 21.54 in 2012 and 16.96 in 2015 for Company 7. Company 6 also had very low LTCR, declining from an average low of 3.54 in 2012 to 2.14 in 2015. However, just like for Company 5, its SR increased from 30.7 in 2013, to 59.7 in 2013 and 48.6 in 2014. Company 7 on the other hand experienced higher LTCR which went from 12.43 in 2012 to 11.3 in 2015. The severity of its incidents (i.e. SR) was also higher than Company 6's and increased from 52.19 in 2012 to 142.05 in 2013 before declining to 56.52 in 2015. Company 8 had the best overall safety performance. It not only had the lowest RIR of 8.05 in 2012 to 9.91 in 2015, the number of lost days to incidents (i.e. SR) also declined from 44.51 in 2012 to 41.08 in 2015. The number of incidents resulting in lost days (i.e. LTCR) were also very low and ranged from 2.37 in 2012 to 2.7 in 2015. This company's metrics demonstrated its high commitment to safety.

The above analysis reveals a potential relationship between RIR and SR values. More specifically, Spearman's correlation test showed a positive statistically significant correlation between RIR and SR values with an R of 0.565 and a p-value of 0.023. This means that if the number of incidents per 100 workers increases, the number of days lost to incidents will also increase and vice-versa. No statistically significant relationships could be detected between RIR and LTCR values or between SR and LTCR values.

4.3.2 Disability Management Performance

Figure 11 shows the performance of Companies 1, 3, 4 and 7 with respect to the DM5, DM6, DM7, DM9 and DM10 metrics.

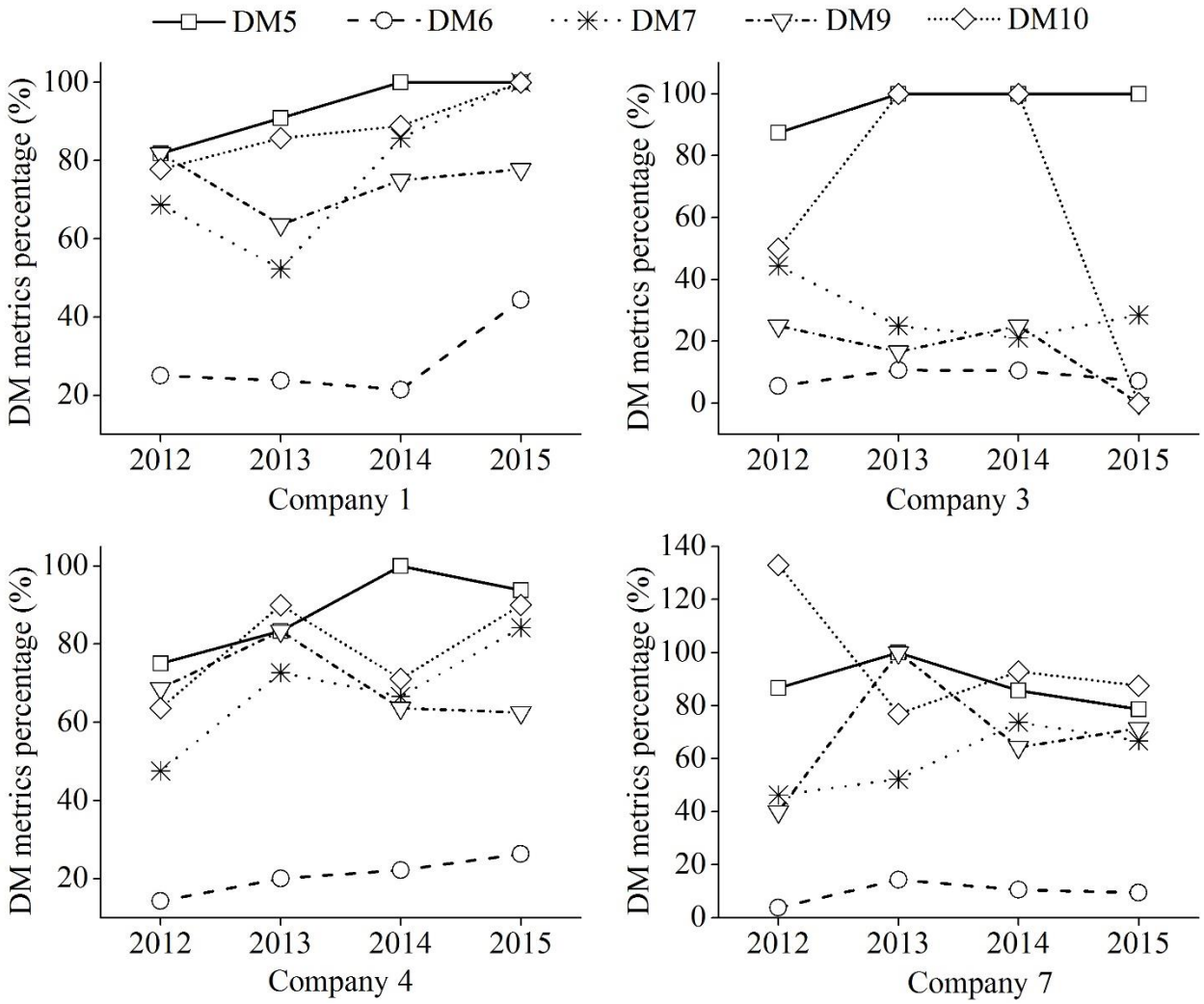

Figure 11: DM Performance Trends

Figure 11 shows that Company 1 and Company 3 witnessed an increase in the percentage of workers returning back to work (i.e. DM5) between 2012 and 2013, with that percentage increasing from 81.81% to 90.9% for Company 1 and from 87.67% to 100% for Company 3. Both companies achieved a DM5 rate of 100% in 2014 and 2015, reflecting a commitment by these companies to full accommodate and integrated injured workers returning to the workplace. Despite their lower safety performance as evidenced by their high RIR and SR for both companies in Figure 9, both companies appeared to have implemented proactive measures to ensure the return of workers

following these injuries. Company 4 also saw a steady increase in that percentage (i.e. DM5) from 75% in 2012 to 100% in 2014, with that percentage dropping to 93.75% in 2015. Company 7 which had one of the lowest RIR and SR had a DM5 rate that ranged from 86.67% in 2012 to 78.57% in 2015, reflecting lower commitment by them to the return of injured workers than Companies 3 and 4. These results show that high RIR and SR do not always translate to high DM5 values and vice-versa since a company with poorer safety performance may be able to integrate injured workers back to the workplace more effectively than a company with better safety performance. The results also highlight the importance of bringing back injured workers to the workplace as soon as they are able to do so. Studies (e.g. Westmorland and N. Buys 2004, Shrey 1995: 1996, Habeck et al. 1998, Loisel et al. 2002, Lingard and Saunders 2004) showed that workers who return to work early on modified duty are more likely to transition back to their original work and reintegrate faster. The longer the injured worker is away, the less likely they are to return back to work. Early referral for rehabilitation services is also strongly correlated with early return to work, both in terms of reducing the time taken to return and increasing the likelihood of that return (Westmorland and N. Buys 2004, Shrey 1995: 1996, Habeck et al. 1998, Loisel et al. 2002, Strautins and Hall 1989).

DM6 measures the percentage of injured workers that required case management. Although this is not a direct measure of performance, it determines the number of injuries that require the assignment of a case manager and the use of case management practices. For Company 1, DM6 increased from 25% in 2012 to 44% in 2015 even though the company experienced its lowest RIR and SR (i.e. 15.69 and 22.66 respectively) in 2015. Company 3 had the lowest percentage of injuries that required case management (i.e. DM6) of all companies with that percentage ranging

from a low of 5.56% in 2012 to a high of 10.52% in 2014. During that same period, its SR went from a low of 15.83 in 2012 to a high of 116.93 in 2014. This reflects a potential relationship between the severity rate of incidents and the number of injuries that require case management. This is not surprising given that case management is usually assigned to severe injuries. Therefore, a higher SR should lead to a higher number of cases management injuries. That relationship was also detected in Company 7 where the company experienced its highest DM6 (i.e. 14.28%) and SR (i.e. 142.05) in 2013 and its lowest DM6 (i.e. 3.85%) and SR (52.19) in 2012. Company 4's DM6 increased gradually from 2012 to 2015, moving from 14.29% in 2012 to 26.3% in 2015. Nevertheless, Company 4's SR decreased during the same period from 48 in 2012 to 35.14 in 2015, calling into question the potential relationship found between SR and DM6 in Companies 3 and 7.

DM7 measures the percentage of injured workers who took time off work due to injury. Company 1 recorded the highest DM7 rates of all companies (i.e. 68.75% in 2012, 52.38% in 2013, 85.71% in 2014 and 100% in 2015) whereas Company 3 recorded the lowest (i.e. 44.44% in 2012, 25% in 2013, 21.05% in 2014 and 28.57% in 2015). Nevertheless, Company 3's SR was one of the highest (i.e. 211.03 in 2013 and 116.93 in 2014). This shows that although a small number of injuries resulted in injury leave in this company, the number of days lost was significantly higher, meaning those injuries were very serious. Company 4's DM7 increased significantly from 47.6% in 2012 to 72.7% in 2013 whereas its RIR declined from 19.2 to 13.54 during that same period. This implies that although less workers were injured in this company over this time period, the percentage of workers who took injury leave rose sharply. Similarly, even though Company 7 had one of the lowest R1Rs for all years, 46.2% of its injured workers took time off work (i.e. DM7)

in 2012.

DM9 and DM10 measure the percentage of injured workers placed on modified work and the percentage of injured workers who transitioned from modified work to their original work respectively. Company 1's DM9 ranged from a high of 81.81% in 2012 to a low of 63.63% in 2013 and reflect a commitment by the company to provide modified work to its injured workers. During the same period, the company's DM10 ranged from a low of 77.78% in 2012 to a high of 100% in 2015 whereas its DM5 varied between 81.81% in 2012 to 100% in 2015. These values reflect a potential relationship between the percentage of workers who returned to work (i.e. DM5), the percentage of workers who are placed on modified work (i.e. DM9) and the percentage of workers who return to their original work (i.e. DM 10). This is not surprising given the interrelated nature of these three metrics. For Company 3, although the company's DM5 showed that 100% of injured workers returned back to work starting in 2013, its DM9 showed that only 16.67%, 25% and 25% were placed on modified duties in 2013, 2014 and 2015 respectively. This implies that most injured workers were able to return back to their original work. In 2012, 50% of workers placed on modified work in Company 3 transitioned to their original work (i.e. DM10), with that rate increasing to 100% in 2013 and 2014. Company 4 recorded relatively high rates of transition from modified work to original work (i.e. DM10) with that rate going from 63.63% in 2012 to 90% in 2013, 71.14% in 2014 and 90% in 2015. Interestingly, Company 7 experienced a DM10 of 133% in 2012. This implies that all workers who were place on modified duty in 2012 in addition to workers who were placed on modified duty in previous years transitioned to their original work in 2012. This rate went down in subsequent years to record 76.92% in 2013, 92.85% in 2014 and 87.5% in 2015.

4.4.3 Relationship between Safety and Disability Management Performance

Spearman's non-parametric correlation test was used to assess the relationships between the three main safety metrics of RIR, SR and LTCR and each of the five DM metrics applied (DM5, DM6, DM7, DM9 and DM10). Table 18 shows that none of these relationships was statistically significant which is not surprising given the very small sample size of the companies evaluated. This being an exploratory research, future research should investigate this relationship in a much larger number of companies.

Table 18: Safety and DM Metrics Correlations

	RIR	SR	LTCR
DM5	-.046	.267	-.301
	.866	.317	.257
DM6	-.126	-.118	.100
	.641	.664	.713
DM7	-.483	-.437	.230
	.058	.090	.392
DM9	-.262	-.093	.271
	.327	.733	.310
DM10	-.037	.080	.131
	.892	.769	.628

*. Correlation is significant at the 0.05 level (2-tailed).

4.4.4 Relevance of Newly Developed Metrics

While the existing safety metrics in the literature provide an adequate benchmark of companies' safety performance, they do not adequately benchmark their DM performance. Therefore, construction companies should start benchmarking their DM performance using the DM metrics developed throughout this research. This should involve them tracking, setting targets and reviewing these metrics on a regular basis with the aim of improving them. The proposed metrics provide leading indicators of DM performance that the safety metrics cannot provide. They also provide a form of accountability that ensures proactive support at the organizational level. Applying a supportive rather than a transactional approach to DM can maximize engagement opportunities and help organizations recognize early signs of an ineffective workplace. Even though the research was only able to apply five of the 13 developed metrics, construction companies should consider implementing and collecting data related to all 13 metrics in order to fully benchmark DM performance. The subject of normalizing the metrics and comparing them across firms warrants additional research. Future research should also consider evaluating a larger sample of companies in order to investigate the contributions of individual DM metrics.

4.5 Objective #5: Evaluating Construction Organizations' Disability Management and Safety Performance

The research involved investigating the relationship between the results stemming from applying the CDM3 to evaluate companies' DM maturity and the results stemming from applying the safety and DM metrics to evaluate companies' safety and DM performance respectively. The first

subsection focuses on analyzing the relationship between the CDM3's overall maturity scores and the DM metrics for the companies evaluated. The second focuses on analyzing the relationship between the CDM3's overall maturity scores and the safety performance metrics whereas the third explores the relationship between the maturity of individual DM indicators and the safety metrics.

4.5.1 Relationship between Overall Disability Management Maturity and Disability Management Performance

The research involved investigating the relationship between the companies' overall DM maturity scores (i.e. leading indicators of performance) and each of the five DM metrics applied to those companies (i.e. lagging indicators of performance). This is to explore the way in which a company's overall DM management maturity affects its injured workers' rate of return (i.e. DM5), the percentage of workers that required case management (i.e. DM6), the percentage of workers off work due to injury (i.e. DM7), the percentage of workers on modified duty (i.e. DM9) and the number of workers transitioning from modified work to their original work (i.e. DM10). This relationship was explored in the four companies to which the DM metrics were applied (i.e. Companies 1, 3, 4 and 7).

Figure 12 illustrates the average DM metrics scores for these four companies over the four-year study period from 2012 to 2015 against these companies' overall maturity scores. In looking at the graph, no relationship appears to exist between companies' MS Company scores and the five DM metrics. For example, no relationship seems to exist between companies' overall DM maturity and their workers' rate of return (i.e. DM5). Company 7 had an overall maturity score (MS Company)

of 4.48, but an average DM5 of 87.74% whereas Company 1 had a MS Company of 3.74 but a DM5 of 93.18%. This is not entirely surprising given that a company's overall maturity scores measures their overall maturity with respect to 12 different indicators whereas DM5 focuses specifically on workers' return to work. Therefore, it's entirely possible that a company would achieve low maturity on a relevant indicator such as "Return to Work" yet still end up with a high average maturity score because of it achieving high maturity scores on other irrelevant indicators. Similarly, no relationship appears to exist between the average percentage of workers placed on modified duty (i.e. DM9) and companies' MS Company scores. For example, Company 1 had an MS Company score of 3.74 but an average DM9 of 74.5% whereas Company 3 had an MS score of 4.04 but a DM9 of 16.6%. This does not necessarily imply that Company 3 has low maturity with respect to its ability to place injured workers on modified duty. It may simply mean that most injured workers in Company 3 were able to return back to their original duties. In looking at the average DM5 of Company 3 (i.e. 96.88%), it can be concluded that of the 96.88% of injured workers who returned back to work, only 16.6% were placed on modified duty. The DM9 metric should not therefore be used in isolation of other metrics as it can misrepresent overall performance. It should be used instead in conjunction with metrics such as DM5 to get a better picture of performance. In this case, DM5 appears to be a better indicator of performance than DM9.

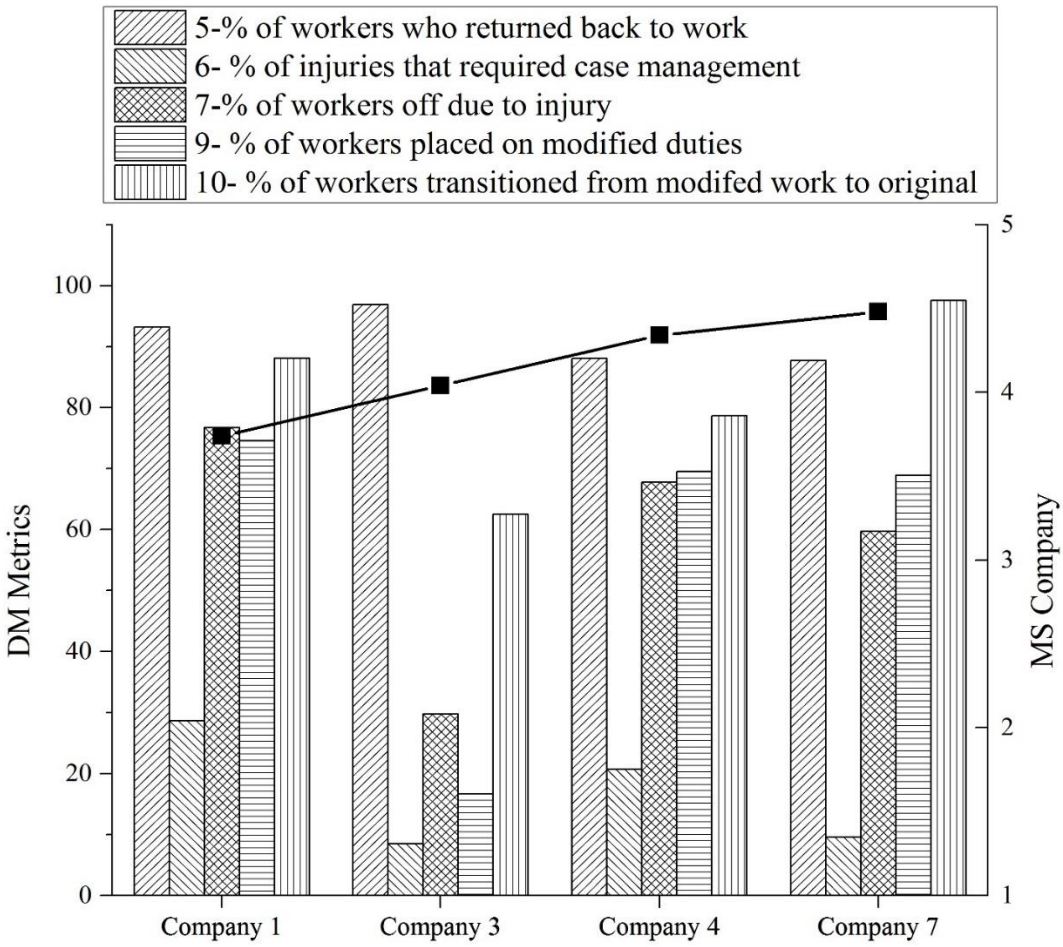

Figure 12: Comparison of DM Maturity and Metrics Data

The lack of a relationship between companies' overall DM maturity scores and their DM performance metrics could also be due to the level of subjectivity associated with evaluating a company's maturity using leading indicators of performance such as the CDM3. This evaluation of maturity relies on the subjective assessment of respondents. Respondents are required to assess the extent to which they think key practices are implemented. Therefore, they may rate their practices as more mature than they really are. Respondents in one company may also rate their practices as more mature than respondents in another company even though the practices in both companies are at the same level of maturity. This highlights the importance of measuring performance using lagging and leading indicators simultaneously. Leading indicators of

performance can help companies determine factors affecting the risk of injury and accommodations available to injured workers. They can also make them more proactive by helping them identify opportunities for improvement before the fact, i.e. before the occurrence of an accident or injury. How well these efforts work in practice will need to be assessed using lagging indicators of performance. Evidence of decreasing rates of return can for instance be a sign that improvements are needed in the DM program. However, lagging indicators do not typically pinpoint where a DM program might need improvement, only how badly it needs it. Since lagging indicators do not explain the "why" behind the bottom line, companies may tend to respond with broad, general corrective actions. Nevertheless, lagging indicators can be useful when identifying trends in past performance. A potential weakness of them is that, unlike leading indicators, companies typically react to them after the fact, which may not be ideal when it comes to preventing work accidents and injuries and keeping workers healthy and safe.

This lack of a relationship between the CDM3 (i.e. leading indicator of performance) and the DM metrics (i.e. lagging indicator of performance) should be investigated in a larger study sample given that this research only evaluated four companies. Future research should also focus on investigating companies that collect most if not all of the data related to the 13 DM metrics developed in this research. This may help establish relationships between the CDM3 and the DM metrics that cannot be detected using only five metrics. Because this area of study is relatively new, there are no direct comparisons that can be made to other studies in the literature evaluating DM. However, a comparison to other studies evaluating other aspects of performance using leading and lagging indicators simultaneously showed similar results. Although Willis and Rankin (2011) had found a potential relationship between the overall maturity of the construction industry

and its lagging performance, this relationship could not be statistically proven despite the study's large sample size. This was also echoed by Goggin and Rankin (2009) who had found a relationship between a company's health and safety maturity score and their health and safety performance in some companies only. Additionally, McCabe et al. (2008) could only establish a relationship between some (leading indicator) health and safety factors and the prevalence of accidents (lagging indicator).

4.5.2 Relationship between Overall Disability Management Maturity and Safety Performance

The research involved investigating the relationship between the companies' overall DM maturity scores derived from using the CDM3 (i.e. leading indicators of performance) and each of the three safety metrics of RIR, SR and LTCR (i.e. lagging indicators of performance). This is to investigate whether companies with more mature DM practices have higher safety performance than companies with less mature DM practices. While the three safety metrics evaluated in this research do not reflect every aspect of health and safety performance, these metrics have been validated and accepted industry wide and are thus generally used by construction companies to track their safety performance.

Figures 13, 14 and 15 depict box plots for the safety metrics of RIR, SR and LTCR respectively against companies' overall DM maturity scores for the eight companies in the sample. In general, companies with higher overall DM maturity appeared to have lower safety metric values and thus higher safety performance than companies with lower DM maturity. More specifically, companies with higher overall DM maturity scores (MS) appeared to have lower RIR. Company 7 for instance

had an MS of 4.48 and an average RIR of 16.58, whereas Company 1 had an MS of 3.74 and an average RIR of 27.92. Similarly, Company 4 had an MS of 4.34 and an RIR of 13.61 whereas Company 5 had an MS of 3.77 and an RIR of 27.21 over the four-year study period. This points to a potential relationship between construction companies' overall DM maturity and their RIR whereby an improvement in companies' DM practices could translate to lower injury rates across their projects. This observation is not illogical given the strong overlap between the concepts of safety management and DM. For the most part, DM tends to fall under safety management in the construction industry. This is because DM essentially encompasses all aspects of safety management in its primary preventive practices such as injury and hazard preventative practices. However, DM extend beyond preventative practices to actually providing accommodations and implementing strategies that integrate disabled and injured workers back to the workplace. Therefore, given this overlap, it would not be surprising to see companies which improve their DM practices experience an improvement in their safety performance. Future research would need to test this observation statistically over a larger study sample. If this observation can be generalized to a larger population, it would provide a strong argument in favour of construction companies prioritizing DM due to its significant safety implications.

However, there are two exceptions to this general trend in the findings. Figure 13 shows that although Company 8 had the lowest MS (i.e. 3.52), it recorded the lowest RIR (i.e. 9.53). Similarly, although Company 2 recorded a high MS of 4.37, it also recorded a high RIR of 25.84. This could be due to the fact that the RIR of Company 2 is being compared to its overall maturity score, rather than to the maturity of its "Disability and Injury Prevention" indicator which would be the most relevant indicator to compare its RIR to. The company may have achieved low maturity on this

particular indicator which would explain its high RIR but high maturity on most other indicators and thus high overall maturity. This reinforces the need to compare companies' safety metrics to the maturity of specific DM indicators rather than to overall DM maturity. The low overall DM maturity of Company 8 may be due to the ad-hoc and random nature of its DM practices. Because of its low RIR, Company 8 may have not felt the need to standardize or prioritize its DM practices, thus its low overall DM maturity. This is a risky position to be in as it would make the company unable to deal with a rise in its RIR because of the ad-hoc and random nature of its DM practices.

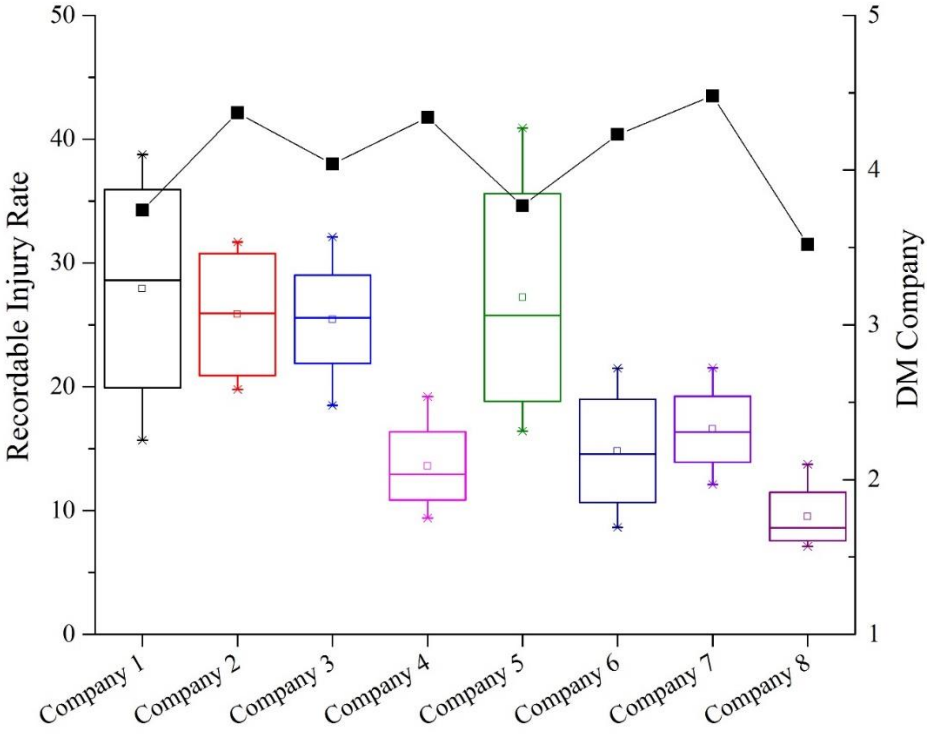

Figure 13: Comparison of DM Maturity and RIR

Similarly, as shown in Figures 14 and 15, companies with higher overall DM maturity scores appeared to have lower SR and LTCR, except for Companies 7 and 8. For instance, Companies 2, 4 and 6 with the highest DM maturity scores recorded the lowest SR (i.e. 44.19, 42.15 and 61.63

respectively) and the lowest LTCR (i.e. 8.45, 6.41 and 2.82 respectively). On the other hand, Companies 1, 3 and 5 had low DM maturity scores, yet recorded high SR (i.e. 82.06, 101.82 and 62.05 respectively), and high LTCR (i.e. 15.82, 6.08 and 6.24 respectively). While a potential relationship may exist between overall DM maturity and historical safety performance, there's a need to analyze that relationship in a much larger sample of companies statistically. There is also a need to investigate the relationship between safety performance as evidenced by these three safety metrics and the maturity of specific DM indicators rather than overall DM maturity given the very specific nature of the metrics evaluated.

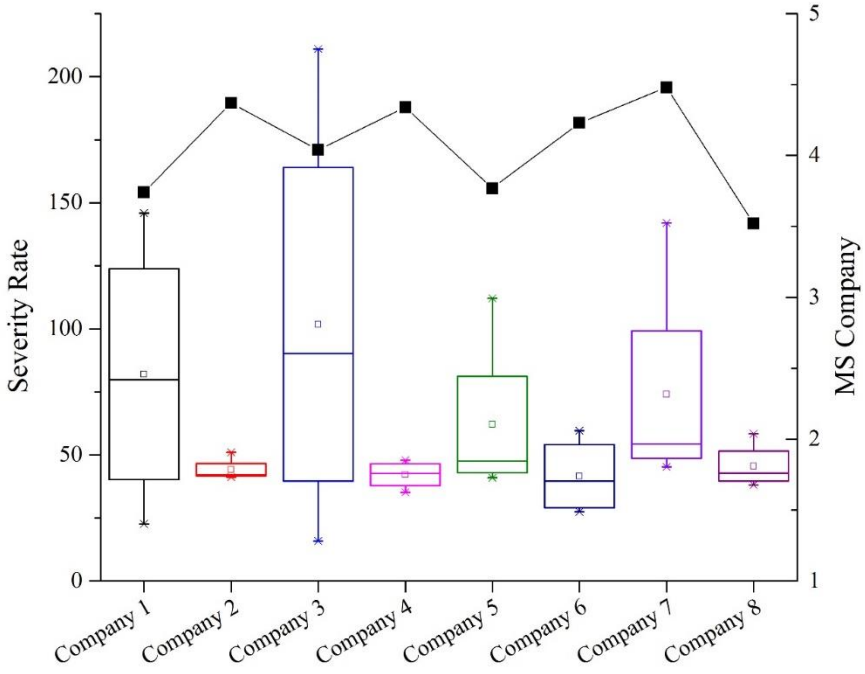

Figure 14: Comparison of DM Maturity and SR

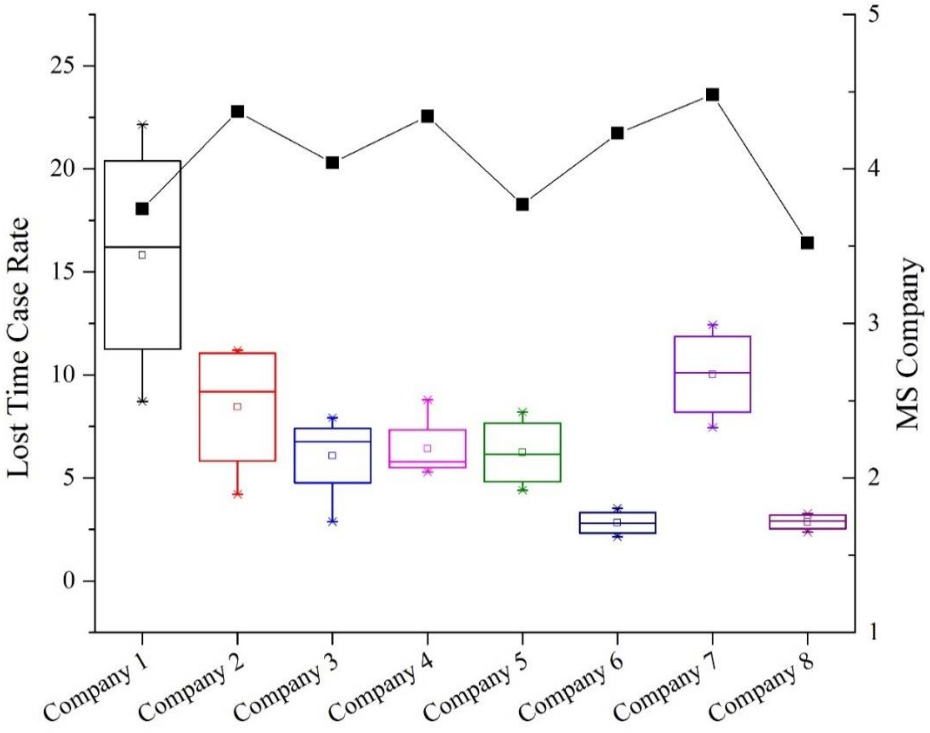

Figure 15: Comparison of DM Maturity and LTCR

4.5.3 Relationship between Maturity of Disability Management Indicators and Safety Performance

The relationship between the three safety metrics of RIR, SR and LTCR and the maturity of specific DM indicators was also assessed using Spearman's correlation test. Of the 12 DM indicators investigated, only "Senior management support" and "Retention and recruitment" practices showed statistically significant correlations to the metrics. More specifically, the results revealed a statistically significant negative correlation between the maturity of "Senior management support" practices and RIR, with an R-value of -0.730 and a p-value of 0.040. There was also a statistically significant negative correlation between the maturity of "Senior management support" practices and SR, with an R-value of -0.861 and a p-value of 0.006.

Additionally, the results showed a negative correlation between the maturity of "Retention and recruitment" practices and RIR with an R-value of -0.711 and a p-value of 0.048. Interestingly, no relationship was found between the maturity of companies' "Disability and injury prevention" practices and these safety metrics despite speculating that this relationship may exist in subsection 4.5.2. Future research should explore these relationships in a much larger sample of companies.

The research also involved investigating the relationship between the maturity of the various DM indicators using Spearman's correlation test. The results revealed a strong statistically significant positive correlation between the maturity of "Case management" practices and the maturity of "Claims management" practices, with an R-value of 0.922 and a p-value of 0.001. Similarly, "Case management" practices correlated positively with "Transitional program management" with an R-value of 0.79 and a p-value of 0.020, and with "Program evaluation" practices with an R-value of 0.755 and a p-value 0.031. The findings also indicated a strong correlation between the maturity of "Return to work" practices and "Program evaluation" practices with an R-value of 0.849 and a p-value of 0.008. Likewise, "Claims management" practices correlated positively with "Program evaluation" practices with an R-value of 0.855 and a p-value of 0.007, and with "Transitional program management" with an R-value of 0.789 and a p-value of 0.020. "Program evaluation" practices and "Transitional program management" were also found to positively correlate with an R-value of 0.723 and a p-value of 0.049. "Regulatory and compliance" polices was also found to be positively correlated to "Injury prevention" practices with an R-value of 0.810 and a p-value of 0.015, and to "Retention and recruitment" practices with an R-value of 0.727 and a p-value of 0.041. These positive correlations are not unexpected given the interrelatedness of the different indicators making up the CDM3 and given that they all contribute to a company's overall DM

maturity. An improvement in one indicator would therefore lead to improvements in other indicators. Therefore, understanding these relationships provides insight into their interdependencies.

4.6 Objective #6: Making Recommendations to Improve Construction Organizations' Disability Management Performance

The research involved developing recommendations to improve construction organizations' DM performance based on the findings of the research as a whole. These recommendations provide guidance to construction organizations looking to implement DM and are based in particular on the best practices defined as part of the DM indicators making up the CDM3 and included in the assessment worksheet shown in Appendix G. These recommendations are presented in bullet-point format and categorized per DM indicator as follows:

4.6.1 Information and Communication

- Design a DM program that maximizes internal and external program support.
- Bring DM to the attention of all employees in a language that can be easily understood.
- Open communication lines and encourage employees to voice their concerns and make suggestions about DM.
- Provide employees affected by the DM program with appropriate information in a timely manner.

- Encourage employees to freely express their injury claim concerns and to make suggestions for improvement.
- Provide employees with regular training about injury management and claims.
- Inform employees of policy changes made concerning injury management and claims.
- Provide employees with regular health and safety training.
- Involve employees in the development of policies and programs related to DM, specifically those that directly affect them.
- Assess employee's knowledge about DM practices on a regular basis.
- Develop a strategic plan that supports a collaborative DM program.

4.6.2 Individual Case Management

- Contact the employee who becomes injured or ill to explain DM services offered and to provide support.
- Contact the employee shortly after an injury or illness to express concern and offer assistance.
- Maintain regular communication with the injured employee's physician to facilitate return to work.
- Conduct an initial assessment of the physical and functional capabilities of the injured employee.
- Conduct a job assessment upon learning about the level of injuries of the employee to determine task restrictions.
- Follow-up with the employee off work to assess his or her ability to return to work.
- Ensure treating physicians are able to identify employee restrictions and capacities and

specify a target return to work date.

- Communicate proactively with physicians about suitable duties, the physical demands of jobs, and the provision of transitional work.
- Ensure a process is in place for finalizing rehabilitations decisions when there are disagreements about them.
- Follow-up with the employee after the leave of absence has ended to facilitate his or her return to work.
- Appoint a case manager for every individual injury case or at least for severe injury cases.
- Provide the DM practitioner with a formal DM training program.
- Examine applicants applying for a DM practitioner position thoroughly to ensure they have the required skills, knowledge and training.
- Ensure the DM practitioner provides ill, injured or disabled employees with all case management services needed in a timely and coordinated manner.
- Ensure the DM practitioner is in regular contact with all relevant stakeholders for active cases.
- Document case activities in compliance with standard practice and regulations.

4.6.3 Return to Work

- Conduct capacity evaluations when there is conflicting or inadequate medical information.
- Ensure evaluations provide the information needed to develop a rehabilitation plan and to identify the employee's functional abilities.
- Ensure the employee and management work together to develop a suitable return to work plan for the employee and update it as rehabilitation progresses.

- Conduct a job analysis that identifies the physical and mental requirements of jobs.
- Conduct a functional assessment of the employee's capacities and job limitations.
- Complete a formal job analysis or functional job description for every job so that the employee's abilities can be compared to job demands.
- Modify job tasks and responsibilities so that they are consistent with the employee's health status and his or her current capabilities.
- Conduct vocational assessments and investigate alternative job placements for employees unable to return to their regular positions.

4.6.4 Claims Management

- Ensure claims management is well coordinated from initial injury to claim resolution.
- Evaluate long-duration claims to determine whether more intensive services are required.
- Provide ample information on medical certificates for sick leave, ill or injured employees' entitlements, and administrative requirements including those related to workers' compensation.
- Ensure the claims or benefit program is designed to support early intervention and return to work.

4.6.5 Disability and Injury Prevention

- Define DM roles and responsibilities as well as disability and injury prevention goals and objectives.
- Include intervention activities aimed at reducing workplace injuries and accidents in the

DM process.

- Implement and monitor a hazard prevention program.
- Provide first-aid services to employees and ensures the availability of first-aid kits.
- Provide qualified first-aid attendants to employees during regular work hours.
- Provide a program that promotes employee health and wellness.
- Provide incentives as part of employee health and wellness programs to encourage employee participation.
- Allocate a budget for disability and injury prevention strategies.
- Develop an accident prevention and safety program administered by a joint worker-management committee.
- Involve employees in safety training programs and safety committees designed to enhance workplace safety.

4.6.6 Transitional Program Management

- Set transitional work program management goals and objectives.
- Actively monitor injured, ill or at risk employees.
- Involve employees and management in the development and management of transitional work programs.
- Provide training to the DM practitioner responsible for return to work (RTW) coordination.
- Ensure the availability of a DM practitioner and committee consisting of both management and employee representatives.
- Implement a written program for individualized formal RTW plans.

- Evaluate the accommodation needs of injured employees who cannot return to their original jobs.
- Ensures consistent management of occupational and non-occupational injuries and illnesses.
- Establish a comprehensive RTW program collaboratively with unions.
- Provide productive and meaningful temporary transitional work.
- Review disability case management intervention protocols to promote quality care, recovery, and cost effectiveness.

4.6.7 Physical Accessibility Management

- Provide well trained and motivated staff that can safely evacuate the workplace in an emergency situation.
- Provide training on evacuation techniques and assistance for disabled and elderly occupants in an emergency situation.
- Investigate all possible physical accommodations for employees with physical disabilities.
- Incorporate physical accessibility features such as lifts, ramps, rails in the workplace.

4.6.8 Program Evaluation

- Maintain records of illness or injury in the workplace.
- Evaluate the outcomes of employee health and wellness programs.
- Build a database containing injury and illness data for individual employees.
- Hold periodic meetings for managers or departmental representatives whereby injury,

illness and disability patterns are reviewed and analyzed.

- Track costs associated with the DM program.
- Use historical data to predict future DM program costs.
- Develop an ongoing monitoring and evaluation process for employees who are accommodated.
- Evaluate the effectiveness of the organizational workplace strategy at regular intervals and make improvements where required.
- Involve employee representatives in the evaluation of DM programs.
- Ensure the anonymity and confidentiality of DM data.
- Use injury and illness data to identify problem areas in the DM program.
- Analyze injury and illness data to determine their causes and identify solutions.

4.6.9 Senior Management Support

- Involve top management in the implementation of the DM program.
- Ensure the safety manager receives support from top management.
- Spend time and money to improve the organization's safety performance.
- Consider safety equally with service and quality in the way work is done.

4.6.10 Regulatory Compliance

- Consider DM a priority that contributes to business success, and regard it as an integral part of the workplace human resource development strategy.
- Formulate the DM strategy in accordance with national legislation, policy and practice.

- Collaborate with employee representatives to formulate a strategy for DM in the workplace.
- Maximize the contributions and abilities of all staff, including those with disabilities and support adherence to occupational safety and health standards.

4.6.11 Recruitment and Retention

- Take into account the occupational preferences of employees with disabilities.
- Investigate all possible accommodations to take advantage as much as possible of the skills of employees with disabilities.
- Implement alternative recruitment qualifying tests to create a fair opportunity for disabled job applicants.
- Provide training that enables recruitment staff to handle issues involving equal opportunity, diversity and disability.
- Include a disabled employee or disability expert as part of the recruitment staff.
- Encourage job applicants to identify arrangements they might require on a jobsite.
- Use the same scoring or assessment system for disabled and non-disabled job applicants.
- Ensure that information about an employee's disability is only passed on to the staff and managers that need it and only with the employee's consent.

4.6.12 Ergonomics

- Undertake ergonomic interventions as needed.
- Evaluate ergonomic interventions to determine if they were successful.
- Design jobs to reduce heavy lifting.

- Design jobs to remove repetitive movement.
- Use ergonomic strategies to improve workstations and work areas.
- Rotate or change job responsibilities to minimize exposure to ergonomic risks.
- Consider ergonomic factors where purchasing new tools, equipment, or furniture.
- Modify work areas and work stations to minimize ergonomic risks before injuries occur.
- Use ergonomic approaches to assist disabled workers returning to work.
- Provide ergonomics training to minimize the risk of injury.

CHAPTER 5: CONCLUSION

This chapter summarizes the most important results and conclusions associated with each research objective. This is followed by a discussion of the research limitations and recommendations for future research. The chapter ends with a presentation of the overall implications of the research.

5.1 Summary of Findings

The research investigated DM in the Manitoban construction industry and its relation to safety performance. The specific objectives of the research, the methods used to achieve each objective as well as the main results and conclusions stemming from the achievement of each objective are summarized in Table 19 below.

Table 19: Summary of Overall Research Results

Objective Research methods	Summary of results
Objective 1: Evaluate the status of DM in the Manitoban construction industry Methods: • Web-based survey to collect data • Survey contained 18 questions: 17 closed-ended and 1 open-ended • The companies were randomly selected through the Construction Safety Association of Manitoba (CSAM) • All data collected were analyzed	• Approximately half of responding construction companies in Manitoba did not employ disabled workers. • Companies engaged less than 1% disabled workers and a tiny minority engaged 5% or more disabled workers. • No statistically significant difference was found between the percentages of disabled workers employed by larger and smaller companies. • Higher number of disabled workers engaged in commercial and heavy and civil work as opposed to residential and industrial work. • Musculoskeletal disabilities were the most common in the companies surveyed, followed by physical mobility and hearing impairments. • Companies noted retaining valued and experienced employees, maintaining employee morale, and reducing costs as the most important reasons for implementing a DM program. • Small proportion of responding companies provided more expensive accommodations to their disabled workers such as accessible washrooms, and accessible workstations. o Larger companies provided them more frequently than smaller ones.
Objective 2: Develop and validate DM indicators that can be used to evaluate construction organizations' DM performance Methods: • Comprehensive literature review to develop indicators • Eight construction management experts were randomly selected for the AHP	• 12 DM indicators were developed and categorized into individual-level and organizational-level indicators. • Consistency ratios of all the experts ranged from 0.0325 to 0.077, with an overall average of 0.0534. • "Return to Work" and "Disability and Injury Management" practices were found to be the most critical indicators • In contrast, "Physical Accessibility" and "Claims Management" practices were the least important.

• Each experts individually conducted the pairwise comparison of the 12 indicators • All data was analyzed	• "Return to Work" practices was deemed 4.5 times more critical than the lowest ranked indicator "Physical Accessibility". • Organization-level indicators were in general deemed to be more important to DM performance than individual-level ones. • The 12 indicators were in general deemed to be encompass the best practices that construction firms should aim to implement as part of a comprehensive DM program.
Objective 3: Develop and implement a model to evaluate the maturity of construction organizations' DM practices Methods: • Data for the 12 indicators were analyzed further to develop the model • 10 construction companies in Manitoba were randomly selected • Interviews were conducted with each of the 10 companies to implement the model • The data for all the companies were analyzed	• The Construction Disability Management Maturity Model (CDM3), benchmarks DM performance in construction companies using the 12 leading indicators. • The Cronbach's alpha (α) value for the assessment worksheet was 0.944, thus above the acceptable threshold. • Companies in Manitoba operating at the quantitatively managed maturity level, with an overall average of 4.06. o Therefore companies had an overall potential growth rate of 18.68%. • The top three performing companies had their highest performance in the indicators deemed most critical and their least mature practices were those that were deem least critical • In contrast, the bottom three performing company's least mature practices were assessed to be the most critical to overall DM performance. • Maturity scores of 8 of 10 companies increased after considering AHP weights. • Smaller-sized companies were performing at a higher level compared to large-sized companies. • "Senior Management Support" and "Disability and Injury Prevention" were found to be the most mature DM indicators. • In contrast, "Retention and Recruitment" practices and "Communication" practices were the least mature. • Possible correlation between the maturity of the DM indicators and the AHP ranking.

Objective 4: Develop and validate metrics to evaluate construction organizations' DM and safety performance Methods: • Data from the previous objective were analyzed to develop and propose 13 new DM metrics • Nine existing safety metrics were selected from the literature • Worksheet developed to collect data from 8 out of the 10 participating companies • Data for 3 safety metrics and 5 DM metrics were collected from 2012-2015 • All data was analyzed	• Developed and proposed 13 DM metrics to enable performance benchmarking using lagging indicators. • Gradual decline in RIR and LTCR over the four years whereas SR remained relatively high during the same period. o Increase in incident severity, resulting in a higher number of lost days incidents • The companies' LTCR performance during 2012 and 2013 fell below the industry average of 6.4 in 2012 and 5.5 in 2013. • Positive correlation between RIR and SR of 0.565 with a p-value of 0.023. • Companies recorded high percentiles in their returned to work rates for injured workers, with few unaccounted absences. • Companies with the lowest RIR and SR over the study period also experienced higher fluctuations in their return to work rates. • Disconnect between high safety performance leading to high DM performance. • Statistically insignificant correlation between safety and DM performance, although the results showed negative correlations between RIR and the 5 DM metrics, indicating a possible relationship.
Objective 5: Evaluate the relationship between the maturity of construction organizations' DM practices, their DM performance and their safety performance Methods: • The relationship between companies' overall DM maturity and their DM performance was investigated • The relationship between companies' overall DM maturity and their safety performance was investigated • The relationship between the maturity of	• The relationship between companies' overall maturity using the model and the DM metrics were found to be statistically insignificant • However, analysis of trends in the data showed that companies with higher maturity scores had relatively lower rates of return, and companies with lower maturity scores had higher rates of return, comparatively • Higher maturity levels did not necessarily translate to more workers being placed on modified duty • Companies with high overall maturity scores had relatively lower safety metrics scores. o For example, companies with relatively higher DM maturity scores recorded lower injury rates for RIR and SR

specific DM indicators and companies' safety performance was investigated • The relationship between the maturity of specific DM indicators was investigated	• Significantly strong negative correlation between the maturity of Senior management support practices and Retention and Recruitment practices to RIR and SR
Objective 5: Make recommendations to improve the maturity of construction organizations' DM practices	• Recommendations aiming to improve the maturity of construction organizations' DM practices were categorized per DM indicators. • A full list of those recommendations can be found in section 4.6.
Methods: • Rely on findings on the overall research • Rely in particular on indicators and best practices defined as part of the CDM3	

5.2 Limitations and Recommendations

One key limitation of the research includes its small sample size. With respect to the first research objective, the 88 organizations surveyed cannot be considered representative of the entire population of construction organizations across Manitoba and as such, the conclusions made about the sample cannot necessarily be generalized to the entire population. Future research should focus on using a sampling method that does not unintentionally favour one group of respondents over another. The survey sent out to the entire population of CSAM members may have inadvertently led to sampling bias whereby those with a vested interest in the topic or had a positive impression of DM programs would have been more likely to respond, which in turn may have skewed the results. To address this, future research should clearly define key terms such as "disability", "disabled people" and "disabled workers" and communicate these definitions to survey respondents in order not to leave such terms open to interpretation by them which would skew the results. For example, one organization may consider a "disabled worker" a worker with a physical or mental impairment. A second may consider him or her to be a worker with no physical or mental impairment yet unable to perform a specific work task because of specific health problems.

With respect to the third, fourth and fifth research objectives, the small sample size of 10 construction companies in Manitoba represented an important limitation when benchmarking DM performance. The research is only exploratory in nature and as such, the results derived from applying it to ten local construction companies in Manitoba cannot be considered representative of all construction companies in Manitoba. The small sample size did not help uncover statistically significant relationships between companies' DM maturity, and their DM and safety performance. Therefore, future research should investigate these relationships in a larger number of companies.

Future research should also analyze these relationships statistically. Regression analysis could be used on a larger sample for example to evaluate the specific contributions of individual DM indicators and their effects on DM performance. A larger sample may also help identify the most effective DM practices implemented by companies of different sizes.

Despite the strengths of the AHP used to determine the relative weights of importance of the DM indicators making up the CDM3, one limitation of the process is the time and effort it took to complete it. Experts carrying out the AHP becoming noticeably fatigued as time went on. Hence, more research is needed to simplify and facilitate the pairwise comparison portion of the AHP, especially for large and complex applications that encompass more indicators. Future research should also focus on involving more experts in the process and on recruiting them from across Canada if the intent is to apply the CDM3 to construction companies across the country. There may also be a need to use the Delphi process in conjunction with the AHP. The Delphi technique helps build consensus by using multiple rounds to collect data from a group of experts. The results of each round are made available to the experts in order for them to decide whether they would like to change their responses or keep them as is. The anonymous responses are aggregated and shared with the group after each round.

Despite its strengths, there were some issues associated with the implementation of the CDM3. One issue involved the time it took to recruit the companies participating in the research and to conduct random verifications of some existing practices. Due to limited finances and a strict schedule, only two researchers were available at any point in time to complete these tasks. This limited the number of companies that could participate in the research and the extent of the

verifications conducted. Furthermore, the actual long-term practicability and usefulness of CDM3 were not directly evaluated. The small number of companies evaluated did not allow for the generalization of the results and for further validation of the model. Therefore, more research is needed to validate the effectiveness of the CDM3 in construction organizations with different cultures and business environments. Further refinement of the model is recommended to ensure it continues to reflect current practice and to ensure its continued usefulness to members of academia and industry. There is also a need to make it more difficult for respondents to determine the most desirable response when completing the assessment worksheet, which may require a redesign of the questions and practices making up each DM indicator. This is to reduce as much as possible the tendency for respondents to select socially-acceptable responses rather than the ones that best reflect their actual practices, and thus to reduce the subjective bias respondents may have when using the model.

Another key limitation was the fact that participating companies did not collect most of the data needed to calculate the safety and DM metrics used in this research. Because of this, only three safety metrics and five DM metrics could be applied and analyzed as part of the research. This limited the analysis that could be conducted and the relationships that could be uncovered based on that analysis. Future research should focus on investigating companies that collect most if not all of the data related to the 13 DM metrics developed in this research. This may help establish relationships between the CDM3 and the DM metrics that could not be detected using only five metrics.

5.3 Contributions and Overall Implications of the Research

This research study is the first to develop and validate DM indicators for the construction industry, and the first to focus on applying those indicators to the Canadian construction industry in particular. Given the poor safety record of the industry and the challenges associated with employing injured and disabled workers, the development of DM indicators should enable construction organizations to develop DM programs that better meet the needs of disabled workers, and ensure their return to the workplace. It should also enable them to evaluate, benchmark and improve these programs and thus their DM performance. Despite progress in the field, there's still reluctance by some organizations to overly invest in existing DM programs, and develop customized RTW programs that require significant financial and human resources.

The research enabled the benchmarking of DM performance with the development and implementation of the Construction Disability Management Maturity Model (CDM3). The model identified and evaluated key practices of DM, relying on proactive rather than reactive measures. The consolidation of factors from past studies, the priority analysis of those factors through AHP, and their implementation via field application present academics with an opportunity to better understand construction DM. It also helps explain a company's approach to DM and how practitioners can implement DM successfully by allowing them to proactively assess a company's existing practices instead of relying on post-accident investigations. As part of the model, the research also outlined and defined DM best practices. These best practices provide the benchmarks that construction organizations should implement as part of their DM programs. As leading indicators, they provide employees and managers with immediate feedback on actions that can lead to incidents or injuries. They also offer an important check on the integrity of systems and

processes designed to foster safe work conditions.

The research also addressed the lack of specific DM metrics in the literature by proposing 13 new DM metrics and using five of them to evaluate construction companies' actual DM performance. While leading indicators of performance such as the CDM3 can help identify opportunities for improvement before the fact, i.e. before the occurrence of an accident or injury, they cannot determine how these opportunities will work in practice. This will need to be assessed using lagging indicators of performance in the form of the metrics. These metrics help assess and quantify past performance. They provide objective benchmarks that researchers and practitioners can use to evaluate actual rather than expected performance. They help track and analyze safety and DM performance data, and enable construction companies to determine the impact of more mature practices on actual DM performance.

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Appendix A

SURVEY CONSENT FORM

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Civil Engineering

Jimmy Winter
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Informed Consent Form

Study Title: Investigating Disability Management Practices and Return to Work Programs in the Construction Industry

Principal Investigator: Jimmy Winter, M.Eng. Student, Construction Engineering and Management
(204) 805.4950 / winterj@myumanitoba.ca

Research Supervisor: Dr. Mohamed Issa, Associate Professor, Construction Engineering and Management
(204) 474.8786 / Mohamed.Issa@umanitoba.ca

Sponsor: Workers Compensation Board of Manitoba

This consent form, a copy of which you may save or print for your records and reference at this time is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to contact us. Please take time to read this carefully and to understand any accompanying information.

Project Description:
Jimmy Winter is conducting this study as a Practicum requirement for the conclusion of the Masters in Engineering, under the supervision of Dr. Mohamed Issa. This research aims to investigate disability management practices and return to work programs currently used in the construction industry. Disability management relates to managing absences from work caused by illnesses, injuries or disabilities, and risk prevention leading to these absences. Return to work programs are tools employers use to proactively help ill or injured workers stay on the job or return to productive employment in a timely and safely manner. The purpose of this survey is to identify the extent to which these practices and programs are being used among contractors in the industry and the nature of the ones in place to manage workplace disability. The survey also aims to assess the extent to which injured and disabled workers successfully return to work, and barriers preventing the successful implementation of these programs and thus the successful reintegration of these workers.

Questions and Time Requirement:
This is an online survey and we estimate it will take no longer than 15 minutes to complete it. There are seventeen multiple choice questions and one open ended question. You will have two weeks to complete this survey. An email will be sent as a reminder to complete the survey after the first week has passed. Please note that participation is voluntary, and that you are free therefore to withdraw from completing the survey, or decline to answer specific question(s) at anytime. Once the survey is completed, it is no longer possible to withdraw data.

Confidentiality:
All of the answers you provide will be kept confidential. Any information you provide will be stored on the encrypted and password protected site, SurveyMonkey®, and on password-protected computers affiliated with Dr Mohamed Issa, RM E3-589. Only the Principal Investigator and his supervisor will have access to your data. If you send us an email or contact us is any other form requesting more information about this study, this communication will be treated will confidence and destroyed once the project is completed. The results of this study should be available by 04/2014.

Dissemination:
This research represents the Masters in Engineering practicum requirements of the principal investigator. The principal investigator plans on disseminating the study results to the scientific community through a conference paper in the upcoming 2014 Association of Researchers in Construction Management (ARCOM) Annual Conference and a paper in the Canadian Journal of Civil Engineering. When presenting the results of this research, we will in no way focus on individual participants' responses and will instead present the findings in summary form. Also a copy will be posted at http://construction.ce.umanitoba.ca and on the Workers Compensation Board of Manitoba's website for anyone interested in this project.

Risks and Benefits:
There are no risks (physical, psychological, and/or emotional) to participants. There are no direct benefits for those participating on this study other than gaining a wider understanding of Return to Work programs and its benefits.

Consent:
By clicking the survey link, you are acknowledging that:

- You have been given sufficient time to consider your participation in this study
- You confirm that you have received, read, and understood all the information provided in this cover letter/consent form and given your full informed consent to participate in the survey.
- You understand that your participation in this survey is entirely voluntary and that you are free to end your participation in the study or decline to answer any question(s) at any time or for any reason.
- You acknowledge that once the survey is completed it is no longer possible to withdraw data.

You understand that by completing this survey, you give your full and informed consent to the research team to use the data collected for the purpose of this research and its dissemination and any related research that follows.

The University of Manitoba may look at your research records to see that the research is being done in a safe and proper way.

This research has been approved by the Education/Nursing Research Ethics Board. If you have any concerns or complaints about this project you may contact any of the above-named persons or the Human Ethics Secretariat at 474-7122, or e-mail margaret_bowman@umanitoba.ca.

If you have read the information presented in this form and do not have any questions about this study, please click the link to the survey when you are ready to begin. You should only click the link if you agree to participate with full knowledge of the study presented to you in this information and consent form and of your own free will.

We strongly encourage you to save or print a copy of this consent form now for your records, as it will not be available later.

If you do not wish to participate in this study now, please don't click at the survey link. You may return to participate at a later date and time. An email will be sent as a reminder to complete the survey in about a week from now. Thank you for considering participating.

Appendix B

SURVEY

Background

1. How would you best describe your organization?
   - ☐ Design
   - ☐ Building Construction
   - ☐ Heavy Construction
   - ☐ Other (please specify)

2. How many employees in total does your organization currently employ?
   - ☐ Under 25 employees
   - ☐ 26-50 employees
   - ☐ 51-100 employees
   - ☐ Over 100 employees

Disability management

3. What percentage of physically or mentally disabled employees does your organization currently employ?
   - ☐ None
   - ☐ 1 – 3%
   - ☐ 4 – 5%
   - ☐ Over 5%

4. What kind of disability do these employees have? Check all that apply and add for each disability the percentage of employees with that disability employed in your organization.
   - ☐ Musculoskeletal
   - ☐ Hearing
   - ☐ Speaking
   - ☐ Seeing
   - ☐ Mental / Psychological
   - ☐ Disease (cancer, diabetes, etc…)
   - ☐ Other (please specify)

5. Does your organization have a specific policy regarding accommodating disabled people / injured workers?
   - ☐ Yes
   - ☐ No

Return to work programs

6. What Return to Work program does your organization use to accommodate injured workers back to their workplace? Check all that apply.
   - ☐ Modified work
   - ☐ Gradual return to work
   - ☐ Temporary alternate work

☐ Other (please specify)

7. Based on your experience, which Return to Work programs are the most beneficial to workers? Please rank the following programs with 1 being the most beneficial program.
   ☐ Modified work
   ☐ Gradual return to work
   ☐ Temporary alternate work
   ☐ Other (please specify)

8. Practically at your organization, what kind of work does an injured worker get following an injury? Please rank the following jobs with 1 being the most common one.
   ☐ Administrative work on main office
   ☐ Administrative work on site
   ☐ Supervision on site
   ☐ Same job yet with some limitations
   ☐ Same job
   ☐ Early retirement
   ☐ Other (please specify)
   ☐ NA

9. What accommodations does your organization provide to disabled/injured workers? Check all that apply.
   ☐ Human support
   ☐ Technical aids/devices
   ☐ Job redesign
   ☐ Modified hours/days
   ☐ Accessible transportation
   ☐ Handrails, ramps
   ☐ Appropriate parking
   ☐ Accessible elevator
   ☐ Accessible workstation
   ☐ Accessible washrooms
   ☐ Jobsite accessibility
   ☐ Other (please specify)

10. Based on your experience, why should an organization have a Return to Work program? Please rank the following potential reasons with 1 being the most important.
    ☐ Legally obligated
    ☐ Improves the image of the organization – marketing
    ☐ Motivates the workers
    ☐ Improves safety
    ☐ Keeps WCB premiums low
    ☐ Other (please specify)

11. Based on your experience, what are the barriers to successfully accommodating disabled / injured workers? Please rank the following potential barriers with 1 being the most

important.

- ☐ Costs of accommodation
- ☐ Disabled / injured worker's motivation
- ☐ No alternate or light duty jobs
- ☐ Disabled / injured workers are not as productive
- ☐ Other co-workers don't feel comfortable among disabled people
- ☐ Health care provider does not provide necessary information
- ☐ Other (please specify)

Financial incentives and other benefits

12. Are you aware that the Government of Canada enables accessibility fund support for eligible projects that improve accessibility? (e.g. Funding: Enabling Accessibility, and Funding: Social Development through Human Resources and Skills Development Canada)
    - ☐ Yes
    - ☐ No

13. Are you aware that by having a Return to work program your organization can reduce costs of injuries and keep WCB premiums low?
    - ☐ Yes
    - ☐ No

14. Have you ever heard about the Return to Work Workshops offered by WCB?
    - ☐ Yes
    - ☐ No

15. Have you attended any of the WCB workshops to enhance or develop a RTW program?
    - ☐ Yes
    - ☐ No

16. Are you aware that WCB supports are available to assist in the planning, coordination, and monitoring of a Return to Work plan?
    - ☐ Yes
    - ☐ No

17. Would these incentives, in practice, improve your organization's policy towards disability management?
    - ☐ Yes
    - ☐ No

General comments

18. Do you have any comments regarding disability management and/or Return to Work programs?

Appendix C

SURVEY ETHICS APPROVAL CERTIFICATE

UNIVERSITY OF MANITOBA | Research Ethics and Compliance
Office of the Vice-President (Research and International)

Human Ethics
208-194 Dafoe Road
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Canada R3T 2N2
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Fax +204-269-7173

APPROVAL CERTIFICATE

February 25, 2014

TO: **Jimmy Winter** (Advisor M. Issa)
Principal Investigator

FROM: **Lorna Guse, Chair**
Education/Nursing Research Ethics Board (ENREB)

Re: **Protocol #E2013:105**
"Investigating Disability Management Practices and Return to Work Programs in the Construction Industry"

Please be advised that your above-referenced protocol has received human ethics approval by the **Education/Nursing Research Ethics Board**, which is organized and operates according to the Tri-Council Policy Statement (2). **This approval is valid for one year only**.

Any significant changes of the protocol and/or informed consent form should be reported to the Human Ethics Secretariat in advance of implementation of such changes.

Please note:

- **If you have funds pending human ethics approval, please mail/e-mail/fax (261-0325) a copy of this Approval (identifying the related UM Project Number) to the Research Grants Officer in ORS in order to initiate fund setup. (How to find your UM Project Number: http://umanitoba.ca/research/ors/mrt-faq.html#pr0)**

- **if you have received multi-year funding for this research, responsibility lies with you to apply for and obtain Renewal Approval at the expiry of the initial one-year approval; otherwise the account will be locked.**

The Research Quality Management Office may request to review research documentation from this project to demonstrate compliance with this approved protocol and the University of Manitoba *Ethics of Research Involving Humans*.

The Research Ethics Board requests a final report for your study (available at: http://umanitoba.ca/research/orec/ethics/human_ethics_REB_forms_guidelines.html) **in order to be in compliance with Tri-Council Guidelines.**

Appendix D

AHP INSTRUCTIONAL SHEET

Background

AHP is an analytic decision making method used to select the best alternative from a number of alternatives using several criteria, which is the twelve indicators (see appendix 1) identified from extensive literature review. The specific criteria for comparison will be the relative importance of an indicator to another in relation to Disability Management overall performance in construction. The indicators will be prioritized by determining the relative weights of the twelve primary indicators using pairwise comparison. The results will be multiplied and correlated with the second and third stage data. This research ethics application is for the first stage only; a separate application will be submitted for the second and third stage after completion of the first stage.

The study will include a maximum of disability management, construction and health and safety experts who will be engaged in an AHP session to determine the parameter weights for the twelve indicators. The AHP process will be based on the expert knowledge and experience of participants in the construction field. Participants of the sessions will seek to make pairwise comparisons of twelve indicators using a nine-point fundamental scale. To ensure consistency of the pairwise comparison, each participant will ask himself or herself which indicator is more important to the overall performance of DM. The relative level of importance will be rated on a nine point scale from “Strongly Disagree” (1) to “Strongly Agree” (9). The subjective ratings will be quantified using the AHP analysis process to determine the weights of each indicator (i.e the eigenvectors or Eigen functions represents the relative importance of the various indicators).

The AHP methodology compares criteria, or alternatives with respect to a criterion, in a natural, pairwise mode. To do so, the AHP uses a fundamental scale of absolute numbers that has been proven in practice and validated by physical and decision problem experiments. The fundamental scale has been shown to be a scale that captures individual preferences with respect to quantitative and qualitative attributes just as well or better than other scales (Saaty 1980, 1994). It converts individual preferences into ratio scale weights that can be combined into a linear additive weight w(a) for each alternative a. The resultant w(a) can be used to compare and rank the alternatives and, hence, assist the decision maker in making a choice. Given that the three basic steps are reasonable descriptors of how an individual comes naturally to resolving a multicriteria decision problem, then the AHP can be considered to be both a descriptive and prescriptive model of decision making. The AHP is perhaps, the most widely used decision making approach in the world today. Its validity is based on the many hundreds (now thousands) of actual applications in which the AHP results were accepted and used by the cognizant decision makers (DMs), Saaty (1994b).

There are three basic principles of AHP: decomposition, comparative judgments, and hierarchic composition or synthesis of priorities [Saaty 1994b]. The decomposition principle is applied to structure a complex problem into a hierarchy of clusters, subclusters, sub-sub clusters and so on. The principle of comparative judgments is applied to construct pairwise comparisons of all combinations of elements in a cluster with respect to the parent of the cluster. These pairwise comparisons are used to derive 'local' priorities of the elements in a cluster with respect to their parent. The principle of hierarchic composition or synthesis is applied to multiply the local priorities of the elements in a cluster by the 'global' priority of the parent element, producing global priorities throughout the hierarchy and then adding the global priorities for the lowest level elements (usually the alternatives).

Determination of Parameter Weights

The performance parameters will be prioritised by determining parameter weights the twelve primary indicators (defined below) using pairwise comparison (Saaty, 1987). The five Construction experts will be engaged in determining the parameter weights for the different units DM. Table 1 shows an example of a completed pairwise comparison matrix. The comparisons will be performed using the fundamental scale for pairwise comparison (see Table 2) developed by Saaty (1987). Table 3 shows that the comparisons will be performed for half of the table; the blank boxes will be the opposite reciprocal of the filled boxes. In its use of AHP, the Construction Disability Management Disability Maturity Model (CDM3) considers the indicators as being the decision alternatives that are being compared and the criteria against which they are being compared is simply “which indicator is more critical/important to the performance of DM?”

Questioning Format (Comparison criteria)

For example: when comparing indicators A & B (on line 1), the decision criteria would assign figures as follows:

- 1 means A and B are equally important
- 3 means A is moderately more important than B, 1/3 or .033 means B is moderately more important than A.
- 5 means A strongly more important than B, and 1/5 or 0.2 means the opposite
- 7 means A has been demonstrated to have very strong importance than B and 1/7 or 0.14 means the opposite.
- 9 means A is extremely more important than B, 1/9 means the opposite
- The following values 2, 4, 6, and 8 can also be used if one is it certain how important one is more than the other or when compromise is needed

NB: Blank boxes or spaces will be the reciprocal of their diagonal value as shown for B, (AHP, is directional and only applies one way either up or down)

Table 1: Determination of indicator weights using pairwise comparison

	A	B	C	D	E	F	Parameter Weight (w)
A	1	c_1	c_2	c_3	c_4	c_5	w_1
B		1	c_6	c_7	c_8	c_9	w_2
C			1	c_{10}	c_{11}	c_{12}	w_3
D				1	c_{13}	c_{14}	w_4
E					1	c_{15}	w_5
F						1	w_6
Sum (Σ)	Σ_1	Σ_2	Σ_3	Σ_4	Σ_5	Σ_6	

c_1 to c_{15} are the number of pairwise comparisons that will be performed for primary parameters by each of the unit participants.

Table 2: Fundamental scale for pairwise comparison (Saaty, 1987)

Intensity of Importance	Definition	Explanation
1	Equal importance	Two indicators contribute equally to the objective/goal
3	Moderate importance	Experience and judgment slightly favor one indicator over another
5	Essential or strong importance	Experience and judgment strongly favor one indicator over another
7	Very strong importance	An indicator strongly favored over another and its dominance demonstrated in practice
9	Extreme importance	The evidence favoring one indicator over another is of the highest possible order of affirmation
2,4,6,8	Intermediate values between adjacent judgments	When compromise is needed
Reciprocal	If activity i has one of the above numbers assigned to it when compared with activity j, then j has the reciprocal value when compared with i	

Completing the table

A drop box link will be sent with the instructional sheet which has your unique excel sheet (like the one shown on table 3) which you will fill out with your decision criteria numbers. The excel sheet has been programed such that you only need to fill out the top section of the table like that demonstrated in table 1. Once you complete it, you just need to save it and I will automatically get your completed table. You are free to make changes to your decision criteria even after you have saved it and I will only receive the latest version.

Disability Management Practice Areas (Indicators)

- *Communication practices*: Related practices cover information provided to all employees about the organization's strategy with respect to DM and accommodations provided at all levels in support of those with disabilities.

- *Case management practices*: These practices deal with individual employees once an injury occurs with the aim of managing their injury and rehabilitating them. Case management is a term used to describe a variety of strategies aiming to manage the health and social services provided to injured employees and their families (Brooker et al. 2012).

- *Return to work and accommodation practices*: These practices involve the completion of a job needs assessment to determine how the DM program can best meet the needs of employees with disabilities and bring them back to work. A comprehensive analysis of employees' skills is conducted to modify their original jobs or identify alternate jobs for which they would be more suited.

- *Claims management practices*: Related practices deal with managing claims related to occupational and non-occupational injuries or illnesses that may entitle individual employees to long-term disability benefits.

- *Disability and Injury prevention practices*: These practices cover the preventative aspects of DM programs. These have matured considerably in recent years and are critical to the overall performance of these programs and to controlling related costs. DM programs should educate employees on these aspects before the occurrence of disabling injuries.

- *Transitional program management practices*: These practices cover the development of a generic DM program for injured employees, which can be customized to individual employees during individualized case management.

- *Physical accessibility management practices*: These practices aim to improve the physical accessibility of construction workplaces to people with disabilities and as such cover physical workplace accessibility requirements.

- *Senior Management and leadership support practices*: These practices involve getting

continuous and consistent support from senior management to ensure the effective implementation of DM programs.

- *Program evaluation practices*: These practices encompass the continuous evaluation of DM programs, customized individual RTW programs and injury and illness statistics to identify necessary program modifications and improvements and justify these programs' costs and benefits as well.

- *Regulatory and compliance policies*: These practices cover existing polices both at the federal and provincial levels. Additionally, it delves into specific policies developed by the organization in relation to accommodating injured and disabled employees. Policies can cover issues such as salary replacement, job accommodation, transitional employment, budgetary responsibility and vocational training when necessary.

- *Recruitment and retention policies*: Practices cover the recruitment process of employees in the construction workplace as well as procedures undertaken to ensure the retention of injured employees. The principle of non-discrimination should be respected throughout the process, to ensure maximal benefit to the employer and equitable opportunities to candidates with and without disabilities.

- *Ergonomic practices*: Related practices should ensure the design of work processes and spaces that minimize injuries, complaints, staff turnover and work absenteeism; meet employers' social and legal obligations and improve employees' health and safety.

References

Saaty, T. L. 1980. The Analytic Hierarchy Process, McGraw-Hill Book Co., N.Y.

Saaty, T. L. (1987). The analytic hierarchy process—what it is and how it is used. Mathematical Modelling, 9(3), 161-176.

Saaty, T. L. 1994a. How to Make a Decision: The Analytic Hierarchy Process, *Interfaces*, 24, 19-43.

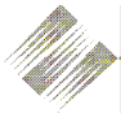
Saaty, T. L. 1994b. Fundamentals of Decision Making, RWS Publications, Pittsburgh, PA

Saaty, T. and Vargas, L. (2001). Models, Methods, Concepts and Applications of the Analytic Hierarchy Process. Kluwer Academic Publishers, Boston, USA.

Yee-Ching Lilia, C., and Bernadette Elea, L. (1991). Performance evaluation and the analytic hierarchy process. Journal of Management Accounting Research, 3, 57-87

Appendix E

AHP INFORMED CONSENT FORM



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Fax (204) 474-7513

UNIVERSITY

Faculty of Engineering

Department of Civil Engineering

Research Project Title: Evaluating the Accessibility of the Manitoban construction Industry to Disabled Construction Workers and its Relation to Safety Performance

Principal Investigator and contact information: Rhoda Ansah Quaigrain, PhD candidate, Room E1-368A Engineering, 15 Gillson St, University of Manitoba, Winnipeg, MB R3T 5V6 Canada, email: quaigrra@myumanitoba.ca

Advisor and contact information: Dr. Mohamed Issa, Assistant Professor, Construction Engineering and Management, Department of Civil Engineering, University of Manitoba, E3-589, EITC, 15 Gillson Street, Winnipeg, MB, R3T 2N2, email: Mohamed.Issa@umanitoba.ca

Sponsor (if applicable): Natural Sciences and Engineering Research Council of Canada and Workers Compensation Board of Manitoba

This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

Why have you been invited to participate?

You are being invited to participate in the first stage of a three stage study aiming to investigate disability management (DM) in the Manitoban construction industry and its relation to safety performance. Please read this consent form carefully before deciding on whether or not to participate in this study. Your participation in this project is voluntary and you may withdraw from

the project at any time prior to the completion of this interview. Your decision to participate or not will be kept in confidence by the researchers (see project team below) and will not be shared with anyone or any institution.

Project team

The project team includes Rhoda Ansah Quaigrain and Dr. Mohamed Issa. Miss Rhoda Quaigrain is a PhD candidate at the University of Manitoba and is supervised by Dr. Mohamed Issa. This AHP is part of Miss Quaigrain's research.

Why is the study being done?

The inadequacy of support and practices at the organizational and managerial levels affects the degree to which construction workplaces can accommodate disabled employees. It is therefore imperative to investigate the level of supports available as well as the mechanisms structured to enable full integration. The outcome of this study will provide a tool that construction organizations can use to evaluate the maturity level of their existing disability management (DM) practices. This study is the first stage of a three stage study. The essence of this stage is to conduct the in analytical hierarchy process (AHP) which is an analytic decision making method used to select the best alternative from a number of alternatives using several criteria.

What are you asked to do?

You are asked to participate voluntarily in the AHP to determine per your experience of working in the field the relative importance and weightings of the twelve identified practice areas of DM as it pertains specifically to construction workplaces. Your responses should draw from your experiences working in the field, project sites, human relations and knowledge gathered and obtained over the years. The session should take a maximum of 20 minutes of your time. You will be asked to complete a short demographics survey prior to the actual AHP. The demographic information seeks to help answer the research questions and (b) to help describe the sample characteristics.

Potential harm/ benefits

There is no known harm or direct benefits to participating in the study. However, your participation will help us better understand teachers' well-being in the context of school environments specifically.

Privacy and confidentiality

The AHP session will not be recorded with an audio electronic recording device. You are asked not to mention your name or refer to other colleagues by name or using any other identifiable information throughout the AHP session. Please use generic words to refer to them. Only the principal investigator and the advisor (i.e. supervisor) will have access to all the information that will be collected for the study. You will work independently and separately. All information gathered from you will be strictly confidential. The information will be completely anonymized and coded to ensure that your responses do not reveal your identity. Recorded weightings,

demographic data and identification codes will be kept in a locked cabinet accessible only by the principal investigator. Direct responses from this interview will not be included in any reports or research publications. Your employer will not have access to any of the data collected for this study. In addition, your employer will not be given any report with respect to the outcome of this stage of the study. At the end of April, 2016, the recorded raw weightings will be permanently deleted. Data sheets will be shredded and the soft copies will be permanently deleted, verified by the Advisor. This data will not be stored in any format by the researchers.

Dissemination

Your direct responses to the AHP will not be included in any report or scientific publication. Your responses will be analyzed for the purpose of developing and validating the maturity model. A copy of the raw weightings will be forwarded to you for verification and your records. You can request a copy of the results that will be generated at the end of this stage of the study; see details below.

Risk and Benefits

You are not required to answer any question in the AHP session you may find distressing. You do not have to answer every question to be able to participate in this study.

You have the right to change your mind

By signing this Informed Consent, you agree to the information contained in inhere and to participating in the study. In no way does this waive your legal rights nor release the researchers, or your employer from their legal and professional liabilities. You are free to withdraw from the study at any time, and to refrain from answering any questions without prejudice or consequence. You will not be required to provide an explanation for doing so. To withdraw from this study, please contact the principal investigator at quaigrra@myumanitoba.ca or 2049529238. In addition, you can also withdraw from this study by informing the principal investigator in person before, during or after the AHP session. Upon withdrawing from this study, your information will be permanently destroyed. If you decide to withdraw your information after you have provided it, you can do so by informing the principal investigator Rhoda Quaigrain at quaigrra@myumanitoba.ca. The principal investigator will permanently destroy your information. Alternatively, your information will be returned to you if requested in your email to the principal investigator; your information will not be duplicated for used in this study.

Can you request a summary of the study results?

You can request a summary of the study results either in electronic or printed version. This summary will be the eigenvectors of the twelve DM practice indicators that should be available by the end of December 2015. To request a summary of the study results, or to ask questions about this study, please contact the principal investigator Rhoda Quaigrain at quaigrra@myumanitoba.ca or at (204) 952-9238 and provide your preferred contact details. Should you have any questions or concerns regarding this research project, you are welcome to contact the Chair of the University of Manitoba's Department of Civil Engineering as follows:

Dr. Ahmed Shalaby, Ph.D., P.Eng.
Professor and Head
Department of Civil Engineering
University of Manitoba
15 Gillson Street, EITC E1-368
Winnipeg, MB R3T 5V6
p: (204) 474-6818, c: (204) 295-6818
e: Ahmed.Shalaby@umanitoba.ca

Ethics review

This research has been approved by the University of Manitoba Education/Nursing Research Ethics Board. If you have any concerns or complaints about this study you may contact any of the above-named persons or the Human Ethics Coordinator (HEC) at 474-7122 or email Margaret.Bowman@umanitoba.ca. A copy of this consent form has been given to you to keep for your records and reference.

How to participate

If you agree to participate in this survey and agree to the information contained herein, please inscribe your signature on the dotted line below.

Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

The University of Manitoba may look at the research records to see that the research is being done in a safe and proper way.

Participant's Signature …….. Date…….

Researcher's Signature …… Date……..

Appendix F

AHP ETHIC APPROVAL CERTIFICATE

UNIVERSITY OF MANITOBA | Research Ethics and Compliance
Office of the Vice-President (Research and International)

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Fax +204-269-7173

APPROVAL CERTIFICATE

August 25, 2015

NSERC and WCB

TO: **Rhoda Ansah Quaigrain** (Advisor M. Issa)
Principal Investigator

FROM: **Thomas Falkenberg, Chair**
Education/Nursing Research Ethics Board (ENREB)

Re: **Protocol #E2015:069**
"Evaluating the Accessibility of the Manitoba Construction Industry to Disabled Workers and its relation to Safety Performance"

Please be advised that your above-referenced protocol has received human ethics approval by the **Education/Nursing Research Ethics Board**, which is organized and operates according to the Tri-Council Policy Statement (2). **This approval is valid for one year only**.

Any significant changes of the protocol and/or informed consent form should be reported to the Human Ethics Secretariat in advance of implementation of such changes.

Please note:

- **If you have funds pending human ethics approval, please mail/e-mail/fax (261-0325) a copy of this Approval (identifying the related UM Project Number) to the Research Grants Officer in ORS in order to initiate fund setup. (How to find your UM Project Number: http://umanitoba.ca/research/ors/mrt-faq.html#pr0)**

- **if you have received multi-year funding for this research, responsibility lies with you to apply for and obtain Renewal Approval at the expiry of the initial one-year approval; otherwise the account will be locked.**

The Research Quality Management Office may request to review research documentation from this project to demonstrate compliance with this approved protocol and the University of Manitoba *Ethics of Research Involving Humans*.

The Research Ethics Board requests a final report for your study (available at: http://umanitoba.ca/research/orec/ethics/human_ethics_REB_forms_guidelines.html) **in order to be in compliance with Tri-Council Guidelines.**

umanitoba.ca/research

Appendix G

MATURITY MODEL ASSESSMENT WORKSHEET

The survey is divided into two parts, Individual level indicators and Organizational level indicators, which categories the 12 indictors based in applicability and level of implementation. Respondents are to choose how applicable each assessment question is to their overall organization and the extent to which each it is implemented within their organization.

PART ONE

Individual Level Intervention Indicators

Information and Communication Practices

The practice entails information provided to all employees on disability in the workplace, along with specific information about the organizational strategy, and about any adaptations which may be needed in a working environment, workstation and work schedules to enable workers with disabilities to optimize their effectiveness.

Assessment Questions

1. The current disability management program communication system is designed so as to maximize internal and external program support

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e) Strongly agree

2. Disability management in the workplace is brought to the attention of all employees and in language that can be easily understood.

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e) Strongly agree

3. Communication is open and employees feel free to voice concerns and make suggestions

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

4. Individuals affected by the disability management program are provided with appropriate information in a timely manner

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

5. Employees are freely able to express their injury claims concerns and make suggestions for improvement

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

6. Employees receive regular training concerning injury management and claims

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

7. Employees are informed of policy changes made concerning injury management and claims

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

8. Employees receive regular training/education in health and safety procedures on site and within work spaces (e.g causes of workplace injury, effective use of materials and equipment etc.)
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
9. Employees are involved in the development of policies and programs related to DM, specifically those that directly affect them
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
10. Employee's knowledge about disability management practices are assessed on a regular basis
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
11. There is a strategic plan that supports a collaborative disability management program
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

Individual Case Management Practices

The practice encompasses dealing with individual cases after the occurrence of injury with the aim to rehabilitating the individual. Case management is a term used to describe a variety of strategies for managing the health and social services for injured workers and their families and typically requires an understanding of multiple factors related to medical care, the work environment, and disability claim processes.

Assessment Questions

1. A designated person is assigned to make contact with any employee who becomes injured or ill within a timely manner to explain the disability management program and to offer support.
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
2. Someone from your workplace contacts the employee shortly after an injury or illness to express concern and offer assistance (Renee et al, 2005).
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
3. Someone from your workplace maintains regular communication with the injured employee's physician to facilitate return to work.
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
4. Initial assessment of the physical and functional capability of the worker related to accommodations in the equipment and work environment are conducted in a timely manner
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
5. Job assessment is conducted upon the receiving the level of injuries as assessed by a physician to determine task restrictions
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
6. Someone from your workplace makes a follow-up contact with employees off work due to injury or illness and assesses their progress toward return to work.
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
7. Treating physicians are asked to identify employee restrictions and capacities and to specify a

target return to work date.
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
8. Proactive and timely communication is made with physicians, sharing information with them about suitable duties, the physical demands of jobs, and the provision of transitional work
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
9. There is a process in place for finalizing policies regarding rehabilitations decisions when there are disagreements about disability management issues
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
10. A follow up of the employee is done after the leave of absence has ended to facilitate his or her adjustment to work post-disability
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

11. A Case manager is appointed for every individual case or at least case severe injury
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
12. A disability management practitioner (or designated individual) in the organization completed a formal training program in disability management
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
13. Candidates for hire as disability management practitioners are examined to ensure they have specific and relevant skills, knowledge and training.
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
14. Duties of the disability management practitioner (or designated individual) are designed in order to optimize return to work coordination and case management
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
15. The disability management practitioner is responsible for ensuring that ill, injured or disabled workers receive all case management services and assistance in a timely and coordinated manner.
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
16. For active cases, the disability management practitioner (or designated individual) is in regular contact with all relevant stakeholders (e.g. disability management committee, supervisors) involved in disability management.
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
17. Progress is monitored for achievement of targeted milestones through ongoing comparison with established best-practice guidelines in order to make recommendations, optimize functional recovery, and provide needed follow-up
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
18. Case notes and reports are prepared using applicable forms and systems in order to document case activities in compliance with standard practices and regulations
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

Return to Work/Accommodation Planning/Practices

The practice includes the completion of a job needs assessment to determine how the DM program can best meet the needs of employees with disabilities with the aim of incorporating the employee (individual) back into work. In this situation, a comprehensive analysis of employees' skills is done to modify their original jobs or identify alternate jobs within the organization for which the employee would be more suited.

Assessment Questions

1. Capacity evaluations are conducted in situations where there is conflicting or inadequate medical information.

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

2. Evaluations provide detailed information necessary for the development of a rehabilitation plan, clarify prognosis for return to work, and help identify the individual's functional abilities for his or her own occupation or others.

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

3. A Collaborative approach is espoused in each case where the employee and management work together on to develop a return to work strategy for the individual

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

4. Job analysis is conducted by which the specific physical and mental demands of a job are identified

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

5. Functional assessment is conducted, in which the disabled employee's capacities and limitations relevant to particular job demands are thoroughly assessed

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

6. Formal job analyses or functional job descriptions are completed for each job in the workplace so that the worker's abilities can be compared to job demands

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

7. The organization performs worksite/job analyses using observation, interview, and records review in order to determine the requirements of the jobs in the workplace (follow up to question 6)

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

8. Job modification is conducted by which tasks and responsibilities are modified to be consistent with the employee's state of health and current capacities

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

9. Vocational assessment and alternative job placements are implemented for employees unable to return to their regular position following the onset of a disability/injury

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

10. The organization works with the employee to develop a return-to-work plan and, if necessary, update the plan as rehabilitation progresses

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

Claims Management Practices

The practice encompasses instances where an employee has a non-occupational injury or illness, whereby the disability employee (individual) may be entitled to long-term disability (LTD) benefits. Similarly, where an employee suffers an occupational injury or illness he or she may be entitled to workers' compensation benefits.

Assessment Questions

1. Claims Management practices are clearly defined in the workplace DM policies, goal setting and planning process

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

2. Claims management is well coordinated from initial injury to claim resolution.

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

3. Long duration claims are evaluated to determine whether more intensive services are required

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

4. Guidance and information is provided on medical certificates for sick leave, ill or injured employees' entitlements, and administrative requirements, including those related to workers' compensation

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

5. The current claims/benefit program is designed to support early intervention and return to work.

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

PART 2

Organizational Level Intervention Indicators

Disability and Injury Prevention Practices

These practices cover the preventative aspects of DM programs, which have matured considerably in recent years and are critical to the overall performance of these programs and to controlling related costs. DM programs should educate employees on these aspects before the occurrence of disabling injuries

Assessment Questions

1. Disability management policy and program roles and responsibilities have been clearly defined in the workplace's goal setting and planning process

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

2. Regular planning process is in place to set disability/injury management prevention goals and objectives
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
3. The disability management process includes intervention activities aimed at reducing workplace injuries and accidents
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
4. The organization implements and monitors a hazard prevention program
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
5. The organization provides first-aid services to employees and ensures the availability of first-aid kits
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
6. The organization makes qualified first-aid attendants available to employees during regular working hours
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
7. The organization has a program promoting employee health and wellness
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
8. Employee health and wellness programs provide incentives to encourage employee participation
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
9. The organization implements stress management and health and wellness programs which have been demonstrated to reduce the number of disability claims (Lewis, 1993)
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
10. The organization allocates a budget for disability and injury prevention strategies
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
10b. If such a budget exist provide the range as to how much is allocated:

11. The organization has an accident prevention and safety program administered by a joint worker-management committee
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
12. Employees participate in both safety training programs and safety committees designed to enhance workplace safety.
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

Transitional Program Management Practices:
These practices cover the development of a generic DM program for injured employees that can be customized to the individual employee during the individualized case management.

Assessment Questions
1. There is a regular planning process in place to set transitional work program management goals and objectives

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

2. The organization utilizes technological/organizational tools such as computerized clinical protocol (called "Work-Ability" programs) to reduce the length of disability leaves

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

3. The organization actively monitors injured, ill or at risk workers to determine if they should be referred to a disability management program

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

4. A collaborative approach involving employees and management is espoused in the development and management of disability management workplace programs specifically transitional work.

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

5. The organization provides formalized education for individuals responsible for RTW coordination and acting in the DM role

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

7. The designated individual leads the DM program

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

8. The organization has a disability management practitioner and/or a disability management committee consisting of both management and worker representatives

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

9. The organization implements a written program including policies, procedures and a process for individualized formal RTW plans

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

10. What is the level of detail of the written program? (Follow up to previous question 9)

11. The organization initiates an analysis of the accommodation needs of injured workers who cannot return to their original job

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

12. The organization ensures consistent management of occupational and non-occupational injuries/illnesses

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

13. The organization ensures there is a documented comprehensive RTW program established collaboratively with unions

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

14. The organization provides productive and meaningful transitional work that is time limited

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

15. Transitional work that is provided progresses the employee with an injury or illness towards returning to a regular position at the organization

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

16. Reviews of disability case management intervention protocol are conducted using standards of care in order to promote quality care, recovery, and cost effectiveness

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

Physical Accessibility Management Practices

These practices aim to improve the physical accessibility of construction workplaces to people with disabilities and as such cover physical workplace accessibility requirements.

Assessment Questions

1. The organization has well trained and motivated staff so that premises can be safely evacuated in an emergency situation in less time than is suggested

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

2. Staff training programmes include evacuation techniques and assistance for disabled and elderly occupants

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

3. Managers and colleagues seek knowledge of any additional support and guidance that will help accommodate a new recruit (Workstation, toilets, canteens, rest rooms, emergency and evacuation procedures, etc.)

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

4. Requirements are met in advance of the candidate's starting date (follow up to previous question)

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

5. The organization's office premises incorporate physical accessibility features such as lifts, ramps, rails etc.

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

Program Evaluation Practices

This is where the workplace program is evaluated regularly. This allows the employer to identify necessary program modifications and improvements and analyze injury and illness statistics (OHSAH, 2010). It also helps justify program costs and assess its benefits. The evaluation ensures that the program meets not only its overall objectives, but employees' needs as well. The RTW plan for each employee should also be evaluated accordingly.

Assessment Questions

1. The organization maintains records of illness or injury in the workplace

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

2. Various data gathering techniques and statistical analyses are used to evaluate the impact of the interventions on program goals

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

3. The organization evaluates the outcomes of their employee health and wellness programs

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

4. There exists a database containing injury and/or illness data for individual employees and identifies information about trends (e.g., most common injury type)

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

5. Periodic meetings are held for managers or departmental representatives whereby injury, illness and disability patterns are reviewed

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

6. The organization tracks costs associated with the disability management program

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

7. Trend data on direct and indirect costs is used to predict both the direct and indirect costs of disability management in the future

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

8. The organization has ongoing monitoring and evaluation process for individuals who are accommodated

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

9. The organization evaluates the effectiveness of their workplace strategy on the management of disability at regular intervals and make improvements where required

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

10. Worker representatives at the workplace have access to the evaluation and participate in it

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

11. Information regarding the disability management programme is made anonymous and confidentiality protected, before being distributed

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

12. The organization uses injury and illness data to identify problem areas and achieve accountability in the disability management program

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

13. The organization analyzes injury and illness data to target causes and identify solutions

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

Senior Management Support/Leadership

These practices involve getting continuous and consistent support at the senior management level to ensure the effective implementation of DM programs.

Assessment Questions

1. Top management is actively involved in the disability and safety program.

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

2. The safety manager receives support from top management.

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

3. The organization spends time and money on improving safety performance
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
4. The organization considers safety equally with service and quality in the way work is done
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

Regulatory & Compliance Policies

These practices cover existing polices both at the federal and provincial levels. Additionally it delves into specific policies developed by the organization in relation to accommodating injured and disabled workers. Policies can cover issues such as salary replacement, job accommodation, transitional employment, budgetary responsibility and vocational training when necessary

Assessment Questions

1. The organization considers the management of disability issues in the workplace a priority task that contributes to business success, and regards it as an integral part of the workplace human resource development strategy.
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
2. The disability management strategy is formulated in accordance with national legislation, policy and practice, taking into account national institutions and organizations in the field
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
3. In formulating a strategy for managing disability issues in the workplace, the organization collaborates with employee representatives and consults with disabled workers or their representatives.
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
4. The organization complements the human resource development strategy in its aim to maximize the contributions and abilities of all staff, including those with disabilities and support adherence to occupational safety and health standards and related early intervention and referral procedures
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
5. The disability management strategy considers provision for employees who support a disabled member
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

Recruitment and Retention Policies

Practices cover the recruitment process of employees in the construction workplace as well the procedures undertaken to ensure the retention of injured workers. The principle of non-discrimination should be respected throughout the process, to ensure maximal benefit to the employer and equitable opportunities to candidates with and without disabilities.

Assessment Questions

1. In developing measures for the redeployment of workers with disabilities, the organization takes into account the occupational preferences of those workers and consults with worker representatives, if necessary.
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
2. The organization ensures that all possible accommodation are considered in order to utilize the residual potential and skills of that worker, before other steps are taken
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
3. Competent authorities provides guidance, services and incentives to employers, in order to maximize opportunities for people with disabilities to retain their employment
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
4. Alternative recruitment qualifying tests and shift mechanisms are implemented to create a fair opportunity for disabled candidates
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
5. Alternative ways of testing skills are available for some jobs rather than relying on standard paper qualifications that some disabled people may have been denied the opportunity to obtain
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
6. Health requirements are justifiable for workplaces
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
7. Recruitment staff and selection panel members are trained to handle issues involving equal opportunity, diversity and disability
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
8. A disabled employee or disability expert is part of the recruitment panel
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
9. During an interview applicants with disabilities are invited to identify any particular arrangements they might require on a jobsite
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
10. The same scoring/assessment system is used for disabled and non-disabled candidate
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
11. The organization ensures that information about an individual's disability is only passed on to the staff and managers necessary and only with the person's consent
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
12. Managers, colleagues, trade union officials, and first aid staff are aware of the practical consequences of an individual's disability
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
13. Clearly defined job descriptions and explanations of duties are available at the earliest opportunity and forms part of the introduction process
a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree
14. Monitoring checks are implemented to see whether people with disabilities are overrepresented

in rejection decisions for positions. If any patterns emerge, the whole recruitment process is checked

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

Ergonomic Practices

Related practices should ensure the design of work processes and spaces that minimize injuries, complaints, staff turnover and work absenteeism; meet employers' social and legal obligations and improve employees' health and safety.

Assessment Questions

1. Ergonomic interventions are undertaken as needed.

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

2. Ergonomic interventions are evaluated to determine if they were successful

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

3. Jobs are designed to reduce heavy lifting.

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

4. Jobs are designed to remove repetitive movement.

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

5. Ergonomic strategies are used to improve workstations/ work areas.

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

6. Work rotations or changes in job responsibilities are used to minimize exposure to ergonomic risks.

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

7. Ergonomic factors are considered where purchasing new tools, equipment, or furniture.

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

8. Work areas/work stations are modified to minimize ergonomic risks before injuries occur.

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

9. Ergonomic approaches are used to assist disabled workers in returning to work.

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

10. The organization provides education sessions on ergonomics to minimize the risk of injury

a) Disagree b) Somewhat Disagree c) Neutral d) Agree e)Strongly agree

Appendix H

ASSESSMENT WORKSHEET ETHICS APPROVAL CERTIFICATE

UNIVERSITY OF MANITOBA | Research Ethics and Compliance
Office of the Vice-President (Research and International)

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APPROVAL CERTIFICATE

October 20, 2015

NSERC/WCB

TO: **Rhoda Ansah Quaigrain** (Advisor M. Issa)
Principal Investigator

FROM: **Zana Lutfiyya, Acting Chair**
Education/Nursing Research Ethics Board (ENREB)

Re: **Protocol #E2015:084**
"Evaluating the Accessibility of the Manitoba Construction Industry to Disabled Workers and its relation to Safety Performance – Phase 2"

Please be advised that your above-referenced protocol has received human ethics approval by the **Education/Nursing Research Ethics Board**, which is organized and operates according to the Tri-Council Policy Statement (2). **This approval is valid for one year only**.

Any significant changes of the protocol and/or informed consent form should be reported to the Human Ethics Secretariat in advance of implementation of such changes.

Please note:

- **If you have funds pending human ethics approval, please mail/e-mail/fax (261-0325) a copy of this Approval (identifying the related UM Project Number) to the Research Grants Officer in ORS in order to initiate fund setup. (How to find your UM Project Number: http://umanitoba.ca/research/ors/mrt-faq.html#pr0)**

- **if you have received multi-year funding for this research, responsibility lies with you to apply for and obtain Renewal Approval at the expiry of the initial one-year approval; otherwise the account will be locked.**

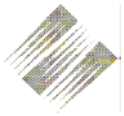
The Research Quality Management Office may request to review research documentation from this project to demonstrate compliance with this approved protocol and the University of Manitoba *Ethics of Research Involving Humans*.

The Research Ethics Board requests a final report for your study (available at: http://umanitoba.ca/research/orec/ethics/human_ethics_REB_forms_guidelines.html) **in order to be in compliance with Tri-Council Guidelines.**

umanitoba.ca/research

Appendix I

ASSESSMENT WORKSHEET INFORMED CONSENT FORM



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Department of Civil Engineering

Research Project Title: Evaluating the Accessibility of the Manitoban construction Industry to Disabled Construction Workers and its Relation to Safety Performance

Principal Investigator and contact information: Rhoda Ansah Quaigrain, PhD candidate, Room E1-368A Engineering, 15 Gillson St, University of Manitoba, Winnipeg, MB R3T 5V6 Canada, email: quaigrra@myumanitoba.ca

Advisor and contact information: Dr. Mohamed Issa, Assistant Professor, Construction Engineering and Management, Department of Civil Engineering, University of Manitoba, E3-589, EITC, 15 Gillson Street, Winnipeg, MB, R3T 2N2, email: Mohamed.Issa@umanitoba.ca

Sponsor (if applicable): Natural Sciences and Engineering Research Council of Canada and Workers Compensation Board of Manitoba

This consent form, a copy of which will be left with you for your records and reference, is only part of the process of informed consent. It should give you the basic idea of what the research is about and what your participation will involve. If you would like more detail about something mentioned here, or information not included here, you should feel free to ask. Please take the time to read this carefully and to understand any accompanying information.

Why have you been invited to participate?
You are being invited to participate in the first stage of a three stage study aiming to investigate disability management (DM) in the Manitoban construction industry and its relation to safety performance. Please read this consent form carefully before deciding on whether or not to participate in this study. Your participation in this project is voluntary and you may withdraw from the project at any time prior to the completion of this survey. Your decision to participate or not will be kept in confidence by the researchers (see project team below) and will not be shared with anyone or any institution.

Project team
The project team includes Rhoda Ansah Quaigrain and Dr. Mohamed Issa. Miss Rhoda Quaigrain is a PhD candidate at the University of Manitoba and is supervised by Dr. Mohamed Issa. This survey is part of Miss Quaigrain's PhD research.

Why is the study being done?
The inadequacy of support and practices at the organizational and managerial levels affects the degree to which construction workplaces can accommodate disabled employees. It is therefore imperative to investigate the level of supports available as well as the mechanisms structured to enable full integration. The outcome of this study will provide a tool that construction organizations can use to evaluate the maturity level of their existing disability management (DM) practices. This study is the second stage of a three stage study. The essence of this stage is to assess the implementation of DM in construction in relation to predefined practices areas of DM.

What are you asked to do?
You are asked to participate voluntarily in this survey to determine per your experience of working in the field the implementation levels of the twelve identified practice areas of DM as it pertains specifically to construction workplaces. Your responses should draw from your experiences working in the field, project sites, human relations and knowledge gathered and obtained over the years. The session should take a maximum of 45 minutes of your time.

Potential harm/ benefits
There is no known harm or direct benefits to participating in the study. However, your participation will help us better understand DM implementation in the construction industry.

Privacy and confidentiality
The survey session will not be recorded with an audio electronic recording device. You are asked not to mention your name or refer to other colleagues by name or using any other identifiable information throughout the focus group Please use generic words to refer to them. Only the principal investigator and the advisor (i.e. supervisor) will have access to all the information that will be collected for the study. All information gathered from you will be strictly confidential. The information will be completely anonymized and coded to ensure that your responses do not reveal your identity. Recorded weightings, demographic data and identification codes will be

kept in a locked cabinet accessible only by the principal investigator. Direct responses from this interview will not be included in any reports or research publications. Your employer will not have access to any of the data collected for this study. In addition, your employer will not be given any

report with respect to the outcome of this stage of the study. At the end of June, 2016, the recorded survey will be permanently deleted. Data sheets will be shredded and the soft copies will be permanently deleted, verified by the Advisor. This data will not be stored in any format by the researchers.

Dissemination
Your direct responses to the survey will not be included in any report or scientific publication. Your responses will be analyzed for the purpose of developing and validating the maturity model. A copy of the raw weightings will be forwarded to you for verification and your records. You can request a copy of the results that will be generated at the end of this stage of the study; see details below.

Risk and Benefits
You are not required to answer any question in the survey you may find distressing. You do not have to answer every question to be able to participate in this study.

You have the right to change your mind
By signing this Informed Consent, you agree to the information contained in inhere and to participating in the study. In no way does this waive your legal rights nor release the researchers, or your employer from their legal and professional liabilities. You are free to withdraw from the study at any time, and to refrain from answering any questions without prejudice or consequence. You will not be required to provide an explanation for doing so. To withdraw from this study, please contact the principal investigator at quaigrra@myumanitoba.ca or 2049529238. In addition, you can also withdraw from this study by informing the principal investigator in person before, during or after the survey sessions. Upon withdrawing from this study, your information will be permanently destroyed. If you decide to withdraw your information after you have provided it, you can do so by informing the principal investigator Rhoda Quaigrain at quaigrra@myumanitoba.ca. The principal investigator will permanently destroy your information. Alternatively, your information will be returned to you if requested in your email to the principal investigator; your information will not be duplicated for used in this study.

Can you request a summary of the study results?
You can request a summary of the study results either in electronic or printed version. This summary will be the maturity scores that should be available by the end of March 2016. To request a summary of the study results, or to ask questions about this study, please contact the principal investigator Rhoda Quaigrain at quaigrra@myumanitoba.ca or at (204) 952-9238 and provide your preferred contact details. Should you have any questions or concerns regarding this research project, you are welcome to contact the Chair of the University of Manitoba's Department of Civil Engineering as follows:

Dr. Ahmed Shalaby, Ph.D., P.Eng.
Professor and Head

Department of Civil Engineering
University of Manitoba
15 Gillson Street, EITC E1-368
Winnipeg, MB R3T 5V6
p: (204) 474-6818, c: (204) 295-6818
e: Ahmed.Shalaby@umanitoba.ca

Ethics review

This research has been approved by the University of Manitoba Education/Nursing Research Ethics Board. If you have any concerns or complaints about this study you may contact any of the above-named persons or the Human Ethics Coordinator (HEC) at 474-7122 or email Margaret.Bowman@umanitoba.ca. A copy of this consent form has been given to you to keep for your records and reference.

How to participate

If you agree to participate in this survey and agree to the information contained herein, please inscribe your signature on the dotted line below.

Your signature on this form indicates that you have understood to your satisfaction the information regarding participation in the research project and agree to participate as a subject. In no way does this waive your legal rights nor release the researchers, sponsors, or involved institutions from their legal and professional responsibilities. You are free to withdraw from the study at any time, and /or refrain from answering any questions you prefer to omit, without prejudice or consequence. Your continued participation should be as informed as your initial consent, so you should feel free to ask for clarification or new information throughout your participation.

The University of Manitoba may look at the research records to see that the research is being done in a safe and proper way.

Participant's Signature …….. Date…….

Researcher's Signature …… Date……..

Appendix J

METRICS DATA SHEET

Instructions

Please fill out the data sheet with corresponding figures for the last **five (5) years**, ideally 2011-2015; a different work sheet for each year must be filled out.

Privacy and confidentiality

The data will not be recorded with an audio electronic recording device. You are asked not to mention your name or refer your company by name or using any other identifiable information throughout. Only the principal investigator will have access to all the information that will be collected for the study. All information gathered from you will be strictly confidential. The information will be completely anonymized and coded to ensure that your responses do not reveal your identity. Recorded weightings, demographic data and identification codes will be kept in a locked cabinet accessible only by the principal investigator. Direct responses from this data will not be included in any reports or research publications. Your employer will not have access to any of the data collected for this study. In addition, your employer will not be given any report with respect to the outcome of this stage of the study. At the end of June, 2016, the recorded data will be permanently deleted. Data sheets will be shredded and the soft copies will be permanently deleted, verified by the Advisor (university representative). This data will not be stored in any format by the researchers.

Performance *Data*	**Year:**												
	Jan.	**Feb.**	**March**	**April**	**May**	**June**	**July**	**August**	**Sept.**	**Oct.**	**Nov.**	**Dec.**	**Total for year**
Number of injuries/illnesses													
Number of incidents/injuries that resulted in days away from work, restricted activity and/or job transfer													
Number of workers on modified or transitional work/duties													
Number of Accidents requiring immediate first aid													
Number of Workers													
Amount of time lost to incidents (hours)													
Number of work hours													

Number of workers off due to injury (short term less than 1 week)													
Number of workers off due to injury (long term more than 1 week)													
Number of workers off due to injury (long term to permanent leave or early retirement)													
Number of workers who returned back from injury leave (period less than three months)													
Number of workers who returned back from injury leave (period more than three months)													
Number of injuries that required case management													

Number of workers who transitioned from temporary work to their original work													
Cost of Claims													
Number of claims													
Cost of premiums													

Injury Breakdown

Injury type	**Year:**												
	Jan.	**Feb.**	**March**	**April**	**May**	**June**	**July**	**August**	**Sept.**	**Oct.**	**Nov.**	**Dec.**	**Total for year**
Number fall injuries													
Number of equipment related injuries													
Number of injuries due to Repetitive motion													
Number of injuries due to falling objects or struck by objects													

Number of injuries due to Electric shock and arc flash													
Number of muscular injuries													

Appendix K

SAMPLE INDIVIDUAL COMPANY REPORT

Evaluating Disability Management in the Manitoban Construction Industry

Company 1 Report

Acknowledgement

This research was supported by a grant from the Research and Workplace Innovation Program of the Workers Compensation Board of Manitoba.

Project Overview

The Manitoba construction industry has a poor safety record. Approximately, 2,063 time loss injuries and 4,269 total injuries were reported by the industry to the Worker's Compensation Board of Manitoba (WCB) in 2012, representing approximately 14% of all reported injuries on that year (WCB 2013). This is despite construction workers representing only 6.7% of the total workforce in Manitoba in 2012. Despite a decrease in heavy and building construction's time loss injury rates from 11% and 7.5% in 2000 to 6.7% and 5.1% in 2011 respectively, these rates were still a lot higher than the 3.3% average time loss rate for all industries in 2012. Building and heavy construction's all injury rates at 14.5% and 10.3% respectively in 2012 were also a lot higher than the provincial average rate of 5.2%. These statistics reinforce the need for effective programs that ensure the timely and safe return of workers with a disability to the workplace and protect them from discrimination. Inadequate support and practices at the organizational and managerial levels affect the degree to which construction workplaces can accommodate disabled workers returning to the workplace. Despite the potential benefits of DM programs in reducing costs and improving workplace morale, many organizations in the construction industry appear unable to develop and implement them. This is met in the literature by limited research attention with no concrete frameworks for the implementation, monitoring and evaluation of construction-specific DM practices, and little empirical evidence about the maturity of DM practices in construction. Moreover, there's little empirical evidence about the maturity of these practices and the status of disability management (DM) in construction in general. Therefore, this research aimed to investigate DM in the Manitoban construction industry and its relation to safety performance. Specific objectives include developing and validating a model to evaluate the maturity of construction organizations' DM practices, and a set of metrics to evaluate their DM and safety performance. The research also evaluated the relationship between the maturity of construction organizations' DM practices, their DM performance and their safety performance. The research made use of maturity modelling to develop the required model. The model developed, called the Construction Disability Management Maturity Model, benchmarks performance in construction companies using 12 disability management indicators which were validated by 8 construction experts using analytical hierarchy process and administered to a sample of 10 general contractors in Manitoba through assessment worksheets. The research provides a tool that construction organizations can use to evaluate the maturity level of their existing disability management (DM) practices. The developed tool evaluates construction organizations' existing policies and practices against the best practices which an organization should aim for to improve their DM performance.

Model Overview

The Construction Disability Management Maturity Model (CDM3) adopts the concept of process improvement epitomised in the process maturity framework. The model aims to define key DM

best practices in the literature, and evaluate the maturity of construction organizations' DM practices against these best practices, providing guidance for improving these organizations' overall DM. The CDM3 incorporates the twelve indicators, which are divided into two different categories based on their level of implementation and applicability: organizational level indicators and individual level indicators. These indicators represent clusters of related activities, which when adhered to enable the achievement of performance goals. The CMD3, has five possible levels of maturity associated with each indicator and the determination of each level of maturity is based on the presence of specific practices. The first level, 'Ad-hoc and chaotic' is assigned a maturity score of either 0 or 1/5, the second level, 'Planned and managed' is assigned a maturity score of 2/5, the third level 'Standardized' is assigned a maturity score of 3/5, the forth level "Quantitatively measured' is assigned a maturity score of 4/5 and the fifth level 'Continuously refining' is assigned a maturity score of 5/5.

Assessment Results

The model was implement on 10 general contractor organizations in Manitoba. Figure 1 depicts the aggregated maturity scores for level of implementation on a scale of 1 to 5 (Ad-hoc to continuously refining) indicating the average maturity score (MS) across all organizations, as well as your company's average values denoted by MS Company 1. Figure 2 provides a further breakdown based on the individual maturity of your indicators against the average maturity across the companies.

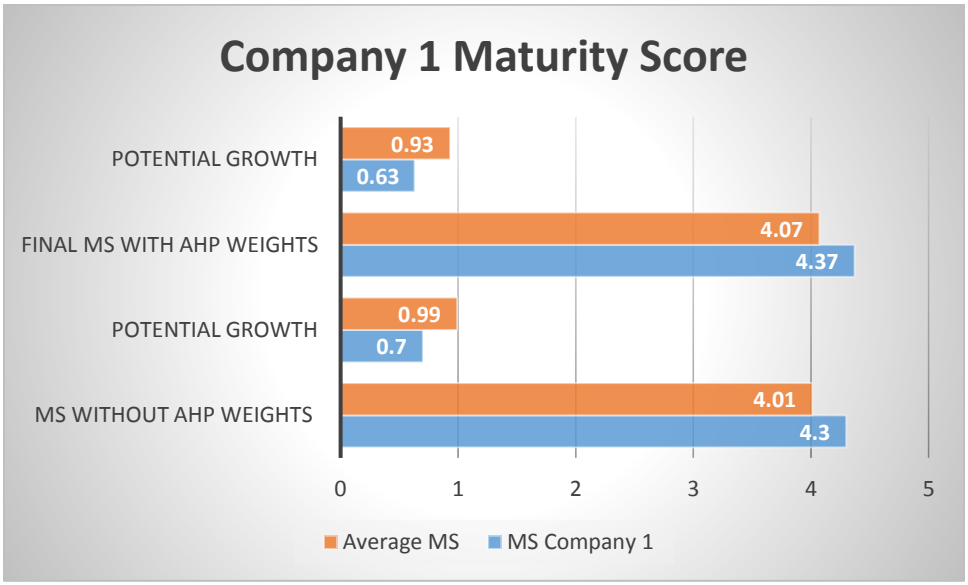

Figure 1: Company 1's Maturity Score and Potential Growth in comparison with average Maturity Score for all the companies

In general, companies had an overall average MS Company of 4.06, with an average PG Company of 18.68% and were thus deemed to be performing at the quantitatively managed maturity level. As expected, Senior Management Support was found to be the most mature DM indicator on average across the 10 companies with an average MS of 4.60. This was followed by Disability and Injury Prevention Disability with an average MS of 4.44. Only 5 out of the 12 indicators were operating at the quantitatively measured level (i.e. average MS greater than or equal to 4 and below 5), with the remaining operating at the standardised level (i.e. average MS greater than or equal to 3 and below 4). The fact that all indicators were performing at a level 3 or higher is a positive indication of growth and shows that the companies assessed were aware of the practices that needed to be implemented and were taking proactive steps to implement them. The least matured indicators were Recruitment and Retention Polices and Communication practices.

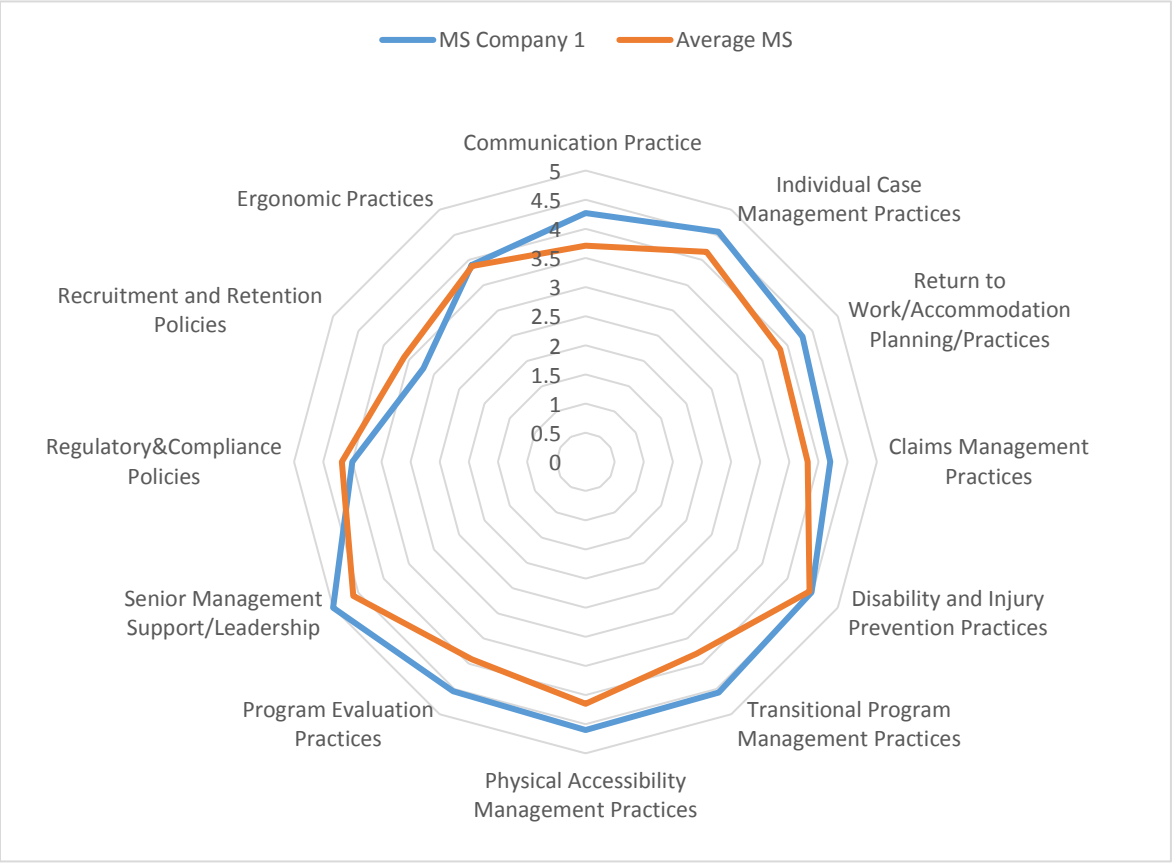

Figure 2: Company 1's Indicator Maturity Score in comparison with average Maturity Score for the indicators

Figure 2, provides comparison of your company with other companies on the implementation of the indicators. The orange line is the average of all companies and the blue line is your company's maturity score for each indicator. The radar chart explains that your company performed better than average of other companies in management practices where the solid blue line is above the orange line. Similarly, your company is behind other companies in implementing practices where the blue line is below the orange line. These are the practice areas which needs improvement at your company level.

For additional information, Table 1 provides the potential opportunities identified for your company based on the assessment.

Table 1: Potential opportunities for implementation for Company 1

Practice Area	Potential Opportunity
Communication Practices	• Bring DM in the workplace to the attention of all employees and in language that can be easily understood. • Ensure Employees receive regular training concerning injury management and claims • Develop and monitor Information routes • Develop a method for Policy change communications • Ensure open communication management with employees • Implement Early intervention communication with employees • Assess and analyze employee knowledge on DM interventions
Case Management Practices	• Develop and implement a post-RTW monitoring and coordination plan for employees • Ensure effective initial assessment of physical and functional rehabilitation • Develop and implement occupational rehabilitation counseling and job skill retraining for employees
Return to Work Practices	• Conduct job needs assessment and Job analysis • Conduct functional assessment for injured workers to assess which jobs would be most suitable • Job and workstation modification

	• Conduct vocational assessment and ensure job placement for employees unable to return to original positions • Conduct intermediate evaluation of progress as workers return to work on modified duties
Claims Management Practices	• Monitor claims management from initial injury to claim resolution • Evaluate of long-duration claims to assess if progress to ensure it quick resolution
Disability and Injury Prevention Practices	• Develop Workplace safety programs • Implement health and welfare programs • Develop and implement Mental health and stress management programs • Promote the proper use and handling of safety equipment, materials and resources in all situations and enforce it where required. • Plan for managing hazards prior to the start of projects by describing each hazard, its potential impact and suggested control mechanisms. • Account for work-related tasks, as well as the promotion of safe practices when defining health and safety roles and responsibilities. • Review project participants' current knowledge and understanding of health and safety practices on a timely basis. • Review project participants' health and safety performance on a timely basis. • Encourage project participants to implement hazard management controls and recognize them for their contribution when doing so
Transitional Program Management Practices	• Develop workplace job accommodation alternatives across the company • Develop a defined process to breakdown organizational level modified duties • Develop a defined process to assess occupational training needs of injured workers unable to return back to work and

	what skills they would require to be able to return back to work in some capacity
Program Evaluation Practices	• Track and analyze workplace incidents data to benchmark performance identify trends • Evaluate injuries which required case management to ensure due protocol was followed and what could be improved on subsequent cases. • Develop a defined process to evaluate RTW cases to track progress of workers on leave due to injury to ensure early return and workers on modified duty to assess of changes are required as per their rehabilitation progress. • Track and analyse injury and illness statistics to benchmark performance • Develop a defined process to implement DM program modifications and improvements as recommended based on the analysis of trends and data
Recruitment and Retention Policies	• Consider revision of recruitment polices to ensure fair assessment of all candidates irrespective of disability • Ensure Pre-employment tests and selection criteria is fair and promote • Develop a defined process to ensure retention and gradual resumption of work of injured workers
Ergonomic Practices	• Develop a process to ensure jobs are designed to reduce heavy lifting • Develop and implement ergonomic strategies for workstations and work areas • Consider Ergonomic strategies and principles in purchasing new tools, equipment, or furniture • Implement ergonomic approaches to assist disabled workers