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**Human errors is continuous risky in construction industry: is it because of negligence or lack of knowledge?**

*Kesalahan manusia terus menerus berisiko dalam industri konstruksi: apakah karena kelalaian atau kurangnya pengetahuan?*

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**Abstract**

Why is human capital relevance in organizations? It is because of relations are essential for hiring, managing, training and retaining talented and high performing employees. Human Capital plays an important role in the recruitment process in all sectors of the economy. Especially in construction it is obligatory obey all requested rules and regulations due to extreme risk of getting injured or fatal death. In some cases lack of attention and knowledge workers face various types' accidents on site. In this paper work it is studied cause and effects of low safety regulation and working requirements during working hours. As for the world experiences in Uzbekistan also major problems in this concern. According to the survey analysis construction sector employees had been studied of safety enforcement. Main purpose of the current paper is examine risk level on site, evaluate human factor and preventing accident rate by reducing workers knowledge and experience for self-awareness.

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## Introduction

As we speak about human capital (human resources, human factor, social capital, and human force) it is directly going to male or female work ability personality. Interesting and meaningful work, which provided safety and preservation of physical, mental as well social health of the individual, is central to human life and well-being. Good working conditions contribute to ability to work, increase productivity and improve competitiveness.

Relevance of the topic are UN New Millennium Goal, UNDP SDG, ILO, WHO, UNIDO, World Social Protection Report, Global Trends: Emerging Construction Labor Markets, A global forecast for the construction industry to 2030, International construction market survey 2018, Human Development Indices and Indicators, Human Resources Annual Report FY 2017-2018, Human Resources Annual Report FY 2017-2018, Human Resources Report 2018, Human Development Index, National Human Development Report 2018, Human Capital Survey Report 2018, The Global Health 50/50 Report 2018, The Inclusive Development Index 2018, Social Finance & Impact Insurance, The Global Human Capital Report 2017, World Employment Social Outlook Trends 2018, World health statistics 2018, monitoring health for the SDGs, sustainable development goals etc.

In Uzbekistan there are lots of reforms on this field: Action of Strategy 2017-2021 which in Section 4 directly states "Support Social sector", announced year of current 2019, "Active investment and Social protection year", State development goal of 2025 for increasing visibility of attractive in Doing Business reforms make extremely reliability of this research.

The next main point of urgency of the topic is in accordance with the ILO, some 600,000 lives would be saved every year if available safety practices and appropriate information were used:

1. Every year, 250 million accidents occur causing absence from work, the equivalent of 685,000 accidents every day, 475 every minute, 8 second;
2. Working children suffer 12 million occupational accidents and an estimated 12,000 of them are fatal;
3. 3,000 people are killed by work every day, 2 every minute;
4. Asbestos alone kills more than 100,000 workers every year [1].
5. According to the ILO figures, the biggest killer in the workplace is cancer, causing roughly 640,000 or 32 per cent of deaths, followed by circulatory diseases at 23 per cent, then accidents at 19 per cent and communicable diseases at 17 per cent. Asbestos alone, the report says, takes some 100,000 lives annually.
6. Worse still, 12,000 children die each year working in hazardous conditions [2]

Main objectivity of this paper work is define human factor from various sources, study main reasons of high accident rate in construction in modern science and technology age and probability of good intelligence or knowledge based construction work force can help reducing accident rate in sectors.

## Literature Review

According to the world safety experiences there are various approaches for studying a human factor as a victim in continuous risky in construction industry:

A lack of competitiveness has been identified by many as the underlying factor behind weak economic growth and high unemployment in Europe. The purpose of this report is to assess the issue of competitive-ness in the EU and other advanced and emerging economies and to promote a clearer understanding of its relationship to the crisis and to long-term labor market and social outcomes. Its policy recommendations, which include investments in new technologies, building a skilled productive workforce and improving credit systems, are important for reinforcing competitiveness while maintaining social cohesion in the EU [3].

Next work examines industrial and employment relations in the emerging economies of Brazil, China, India, South Africa and Turkey while assessing the contribution of industrial relations to inclusive development [4].

Furthermore, the number of individual disputes arising from day-to-day workers' grievances or complaints continues to grow in many parts of the world. The chapters in this book cover individual labor dispute settlement systems in Australia, Canada, France, Germany, Japan, Spain, Sweden, the United Kingdom and the United States [5].

Other scholar explores the question of whether labor law has a positive role to play in promoting economic development, bringing fresh perspectives to a debate that has raged for many years. It includes chapters from leading scholars in the field and presents views and experiences from Latin America, South Asia and

Southern Africa [6].

Human factor is mainly studied detail in the next book which is an interdisciplinary response to the central

contemporary challenges to effective labor regulation. Drawing on contributions by leading experts from the Regulating for Decent Work Network, it offers new ideas for research and policy. The book identifies three central challenges to contemporary labor regulation: intensifying labor market fragmentation; complex interactions between labor market institutions; and obstacles to effective enforcement. International in scope, the volume includes chapters on both advanced economies (Europe and the United States) and the developing world (Argentina, Cambodia, South Africa and Viet Nam) [7].

This guide is a practical tool for those involved in national legislative processes and in the design of labor laws. With Convention No. 189 as its underlying framework, it provides specific guidelines and complements these with examples drawn from a wide range of existing national labor laws concerning domestic workers [8].

Safety control in construction is aimed at reducing work-related accidents and diseases and improving health and working conditions on site. Building on the wealth of PR actioner experience in applying these checkpoints, it presents 132 realistic and flexible solutions that are applicable across a whole range of workplace situations. Each checkpoint indicates an action, tells why it is necessary and how to carry it out, and provides further hints and points to remember [9].

The next approach related with code which covers legal and administrative arrangements, enterprise-level recording, the extension of provisions to the self-employed, the compilation of statistics and the investigation of occupational accidents and diseases, commuting accidents and dangerous occurrences and incidents [10].

## Methods

Paper work used qualitative method with secondary source data collection under various annual reports, statistical analysis and forecast prospective.

## Results and Discussion

According to the Oxford Dictionary human factor is the skills, knowledge, and experience possessed by an individual or population, viewed in terms of their value or cost to an organization or country.

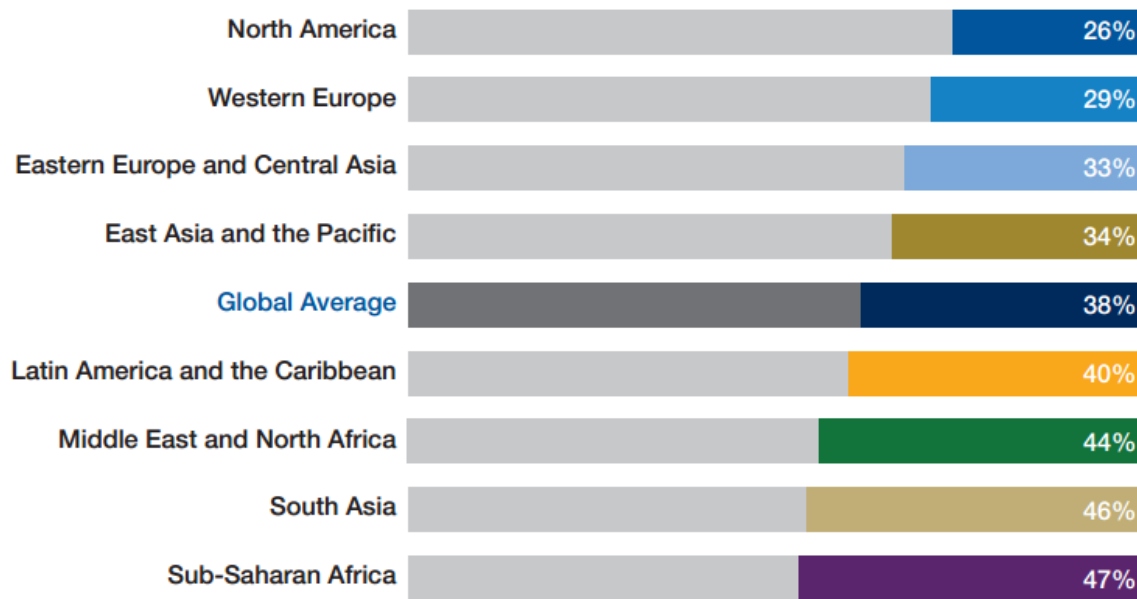
Another source defines that human capital is an intangible asset or quality not listed on a company's balance sheet. It can be classified as the economic value of a worker's experience and skills. This includes assets like education, training, intelligence, skills, health, and other things employers value such as loyalty and punctuality.

One more source defines human factor is the stock of knowledge, habits, social and personality attributes, including creativity, embodied in the ability to perform labor so as to produce economic value.

As for the Investopedia Human capital is an intangible asset or quality not listed on a company's balance sheet. But employers can improve the quality of that capital by investing in employees-the education, experience, and abilities of employees all have economic value for employers and for the economy as a whole.

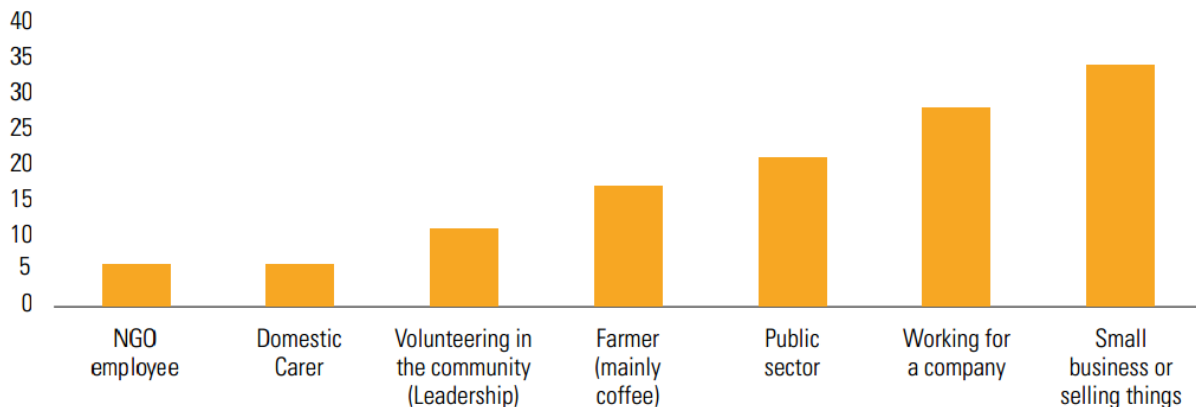
The demands on the education system in preparing students for the workforce in the 21st Century have been significant in several ways. The pace of change in society is accelerating in the economy and in technology as business models shift in all sectors, leading to substantial job destruction, but also new job creation, including new forms of construction work. Education and training systems, having been largely static and underfinanced for decades, are inadequate for meeting the new needs (WEF 2017) [11]. As for the current report Physical health self-reported health, long-term disability, satisfaction in ability in physical activities.





**Figure 1.** Gap in human capital development by region 2017 Source : The Global Human Capital Report, Preparing people for the future of work 2017, p7.

According to the research by Global Human Capital all regions have been studied human capital development. As economic development increased human capital factor is also changing dynamically in regions of the world. North American continent is remaining major highly developed index of the labor and sub-Sahara region countries are extremely hard working conditions with 47 percent of less developed as shown [Figure 1](#).

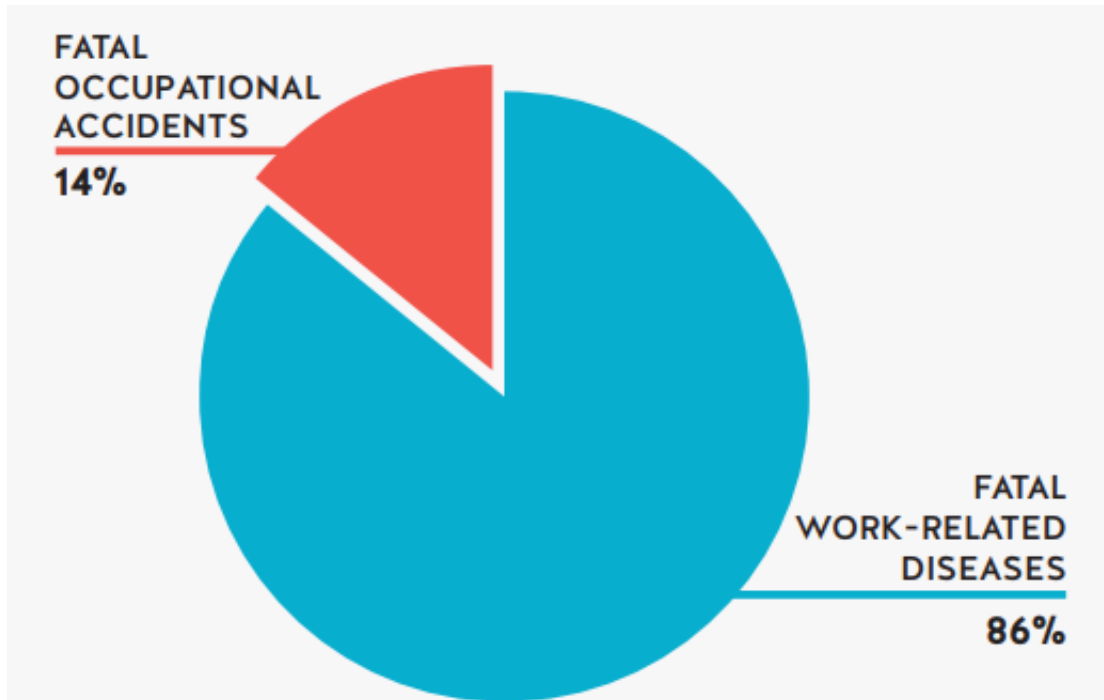


**Figure 2.** Types of employment among youth Source: Timor-Les te 2016 Youth Well-Being Survey

As for the global regulation child labor protection is one of main factor in usage of human capital. But, there lots of illegal working conditions have been recording in world statistics in construction industry. Youth as an employment busy in public sector with 20 percent and small business or retail give a job for almost 33 percent as [Figure 2](#).

Eliminating child labor, while a key policy goal in itself, is also a necessary starting point for achieving decent work for all. This second World Report on Child Labor highlights the close linkages between child labor and good youth employment outcomes, and the consequent need for unified policy approaches [12].

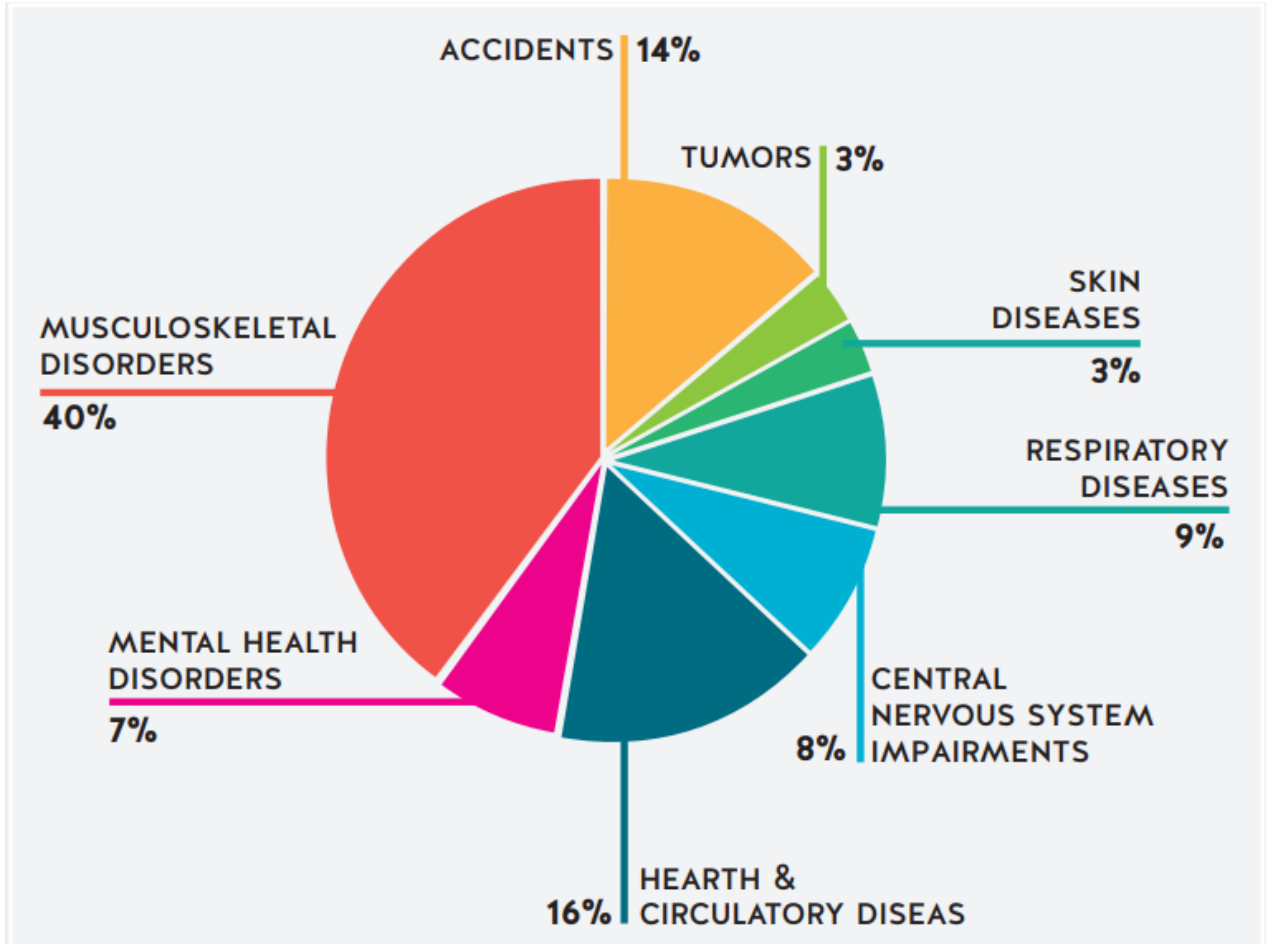
Non-standard forms of employment - including temporary work, part-time work, temporary agency work and other multi-party employment arrangements, disguised employment relationships and dependent self-employment - have become a contemporary feature of labor markets the world over [13].



**Figure 3.** *Effects of Health and Safety accident in the world* Source : *World day for safety and health at work, 28 April 2015 join in building a culture of prevention on OSH, p1.*

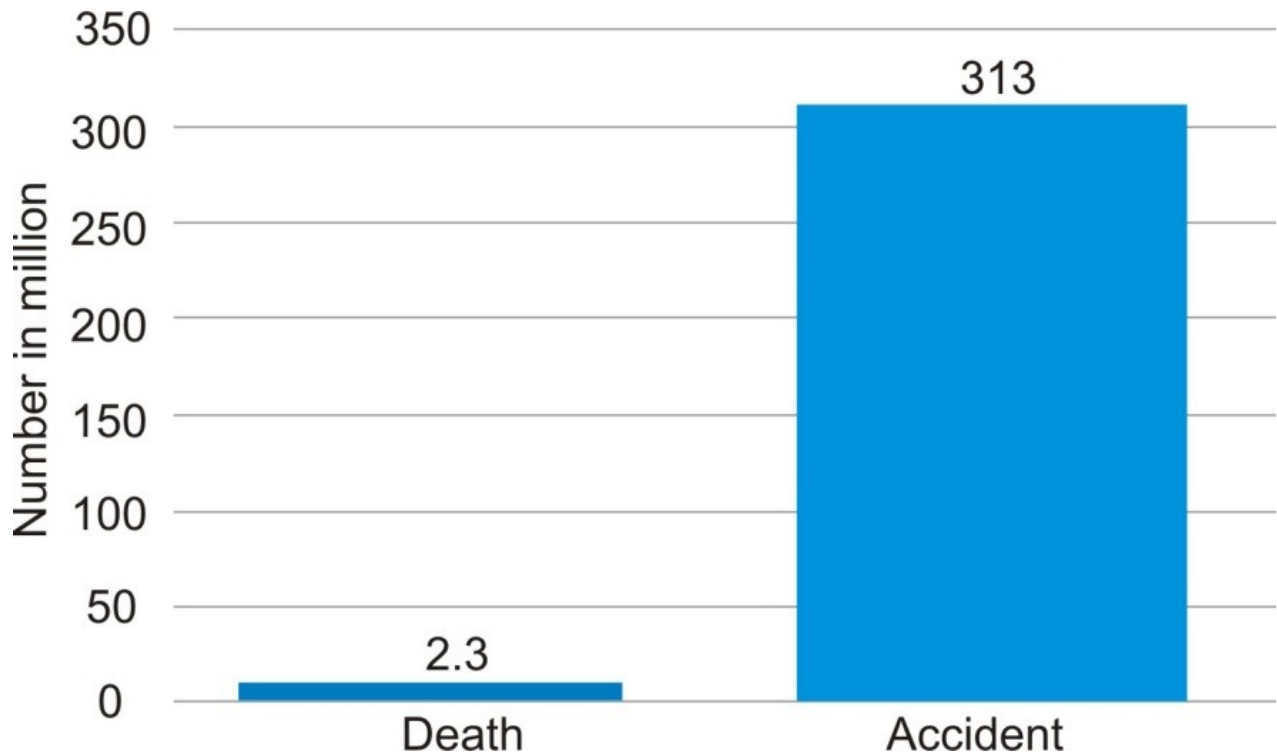
Safety work conditions indicated that only 14 percent of the workers caused fatal accident and remain 86 percentages caused due to work diseases in the world [Figure 3](#).

If we analyze work compensation costs of occupational and work-related accidents and diseases globally it shows following scenario. Safety risk on accidents with 14 percent, metal health disorder 7percent may cause in heredity are the same focused research area which we are studying. The next factor of social cost of the construction projects is musculoskeletal disorder with 40 percent. It means during work time high level overload pull or push factor work conditions. More detail information some statistical data distributed at [Figure 4](#).



**Figure 4.** Global compensation costs of occupational and work-related accidents and diseases Source : World day for safety and health at work, 28 April 2015 join in building a culture of prevention on OSH, p4.

Following figure studies that total work accident rate in sectors. It is very clear analyzed that with minor amount 2.3 mln. workers faced with the problem of fatal death. And majority and terrible quantity 313 mln. workers suffered from various accidents in the world [Figure 5](#).



**Figure 5.** Annual number of work-related deaths and accidents worldwide as of 2018, p1. Source : <https://www.statista.com/statistics/675588/workplace-accidents-and-deaths-annually-worldwide/>

As for the other sources currently, more than 374 million people are injured or made ill every year through work-related accidents. It is estimated that work days lost to OSH-related causes represent almost 4 per cent of global GDP, in some countries as much as 6 per cent, the Report says [14].

Main factor of work related injuries is Back Pain

Interesting Facts about Back Pain

1. Worldwide, back pain is the single leading cause of disability, preventing many people from engaging in work as well as other everyday activities [15].
2. Back pain is one of the most common reasons for missed work. One-half of all working Americans admit to having back pain symptoms each year [16].
3. Back pain accounts for more than 264 million lost work days in one year—that's two work days for every full-time worker in the country [17].
4. Experts estimate that up to 80% of the population will experience back pain at some time in their lives [18].
5. Back pain can affect people of all ages, from adolescents to the elderly.
6. Back pain is the third most common reason for visits to the doctor's office, behind skin disorders and osteoarthritis/joint disorders[19]
7. Most cases of back pain are mechanical or non-organic meaning they are not caused by serious conditions, such as inflammatory arthritis, infection, fracture or cancer [20].
8. Most people with low back pain recover, however reoccurrence is common and for small percentage of people the condition will become chronic and disabling [17].
9. Worldwide, years lived with disability caused by low back pain have increased by 54% between 1990 and 2015 [17].
10. Low-back pain costs Americans at least \$50 billion in health care costs each year-adds in lost wages and decreased productivity and that figure easily rises to more than \$100 billion [21].

Other factors related with back pain in US are:

1. Approximately 80% of Americans will experience back problems at some point in their lives
2. An estimated 10% of the world's population suffers from lower back pain
3. The number of Americans experiencing lower back pain is on the rise
4. Back problems are more common in adult women than men
5. More than one in three adults say back pain impacts everyday activities, including sleep
6. 29% of Americans believe stress is the cause of their back pain
7. 90% of acute low back pain issues are resolved within six weeks

8. *Americans spend at least \$50 billion annually on treating back pain* [22]

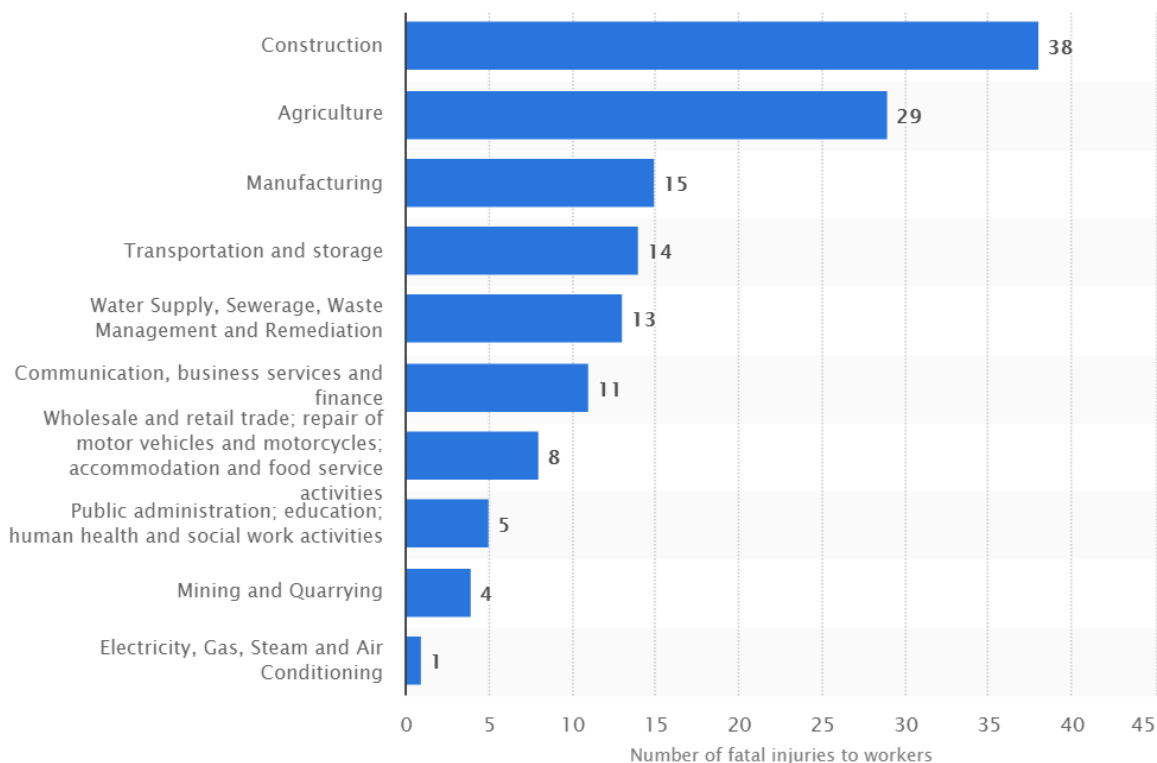
Among backache low back pain is a serious hazard for work potentials. From this point of view we have been studied some statistical analysis and approaches done before us.

1. Low back pain is the leading cause of disability worldwide, affecting an estimated 540 million people at any one time. Yet, a new Series of papers to be published in *The Lancet* highlights the extent to which the condition is mistreated, often against best practice treatment guidelines.
2. Low Back Pain (LBP) is extremely common, and is the largest single cause of years lived with disability in England (Global Burden of Disease 2013)
3. UK specific data shows that LBP was the top cause of years lived with disability in both 1990 and 2010, with a 12% increase over this time -- so the problem is getting worse.
4. LBP accounts for 11% of the entire disability burden from all diseases in the UK.
5. The cost of LBP to the NHS was estimated in 2008 to be £2.1 billion (and costs overall to UK society when we factor in work loss and informal care in region of £10.7 billion) [23].

In the UK in 2006, one in seven of all recorded consultations with general practitioners were for musculoskeletal problems with complaints of back pain being the most common (417 consultations per year for low back pain per 10,000 registered persons) Burden of back pain disability in UK has increased from 1510 disability adjusted life years /100,000 to 1634 DALYs /100,000 -- an 8% increase in spite of massive investments in back pain research and treatment.

Back pain is one of the most common health complaints among adults in the United States. Such pain can be caused by strained muscles or ligaments, excess weight, poor posture, psychological problems, or every day activities. A Statista survey from 2017 found that 29 percent of U.S. adults with back problems believed stress was the cause of their pain, while 26 percent blamed weak muscles or a lack of exercise, and another 26 percent blamed physical work [24].

Following figure shows the number of fatal injuries to workers in Great Britain in 2017/18, by industry. During this reporting year there were 38 fatalities in the construction industry, the most of any sector **Figure 6** [25]. Main reliability of the current analyses are that even in the UK such a highly controlled and regulated working conditions there occurring not too many accidents among workers on site. By comparison any other country or region UK propagates health and Safety regulation in priority in any working sphere rather than time factor, quality and result oriented effective construction projects in the world.



**Figure 6.** Number of fatal injuries to workers in Great Britain in 2017/18, by main industry Source : Official statista.com

Figure 7 shows that scale of the workers in proper fields. These analysis help for clarify either legal or illegal working conditions in any sectors. Why is it so important? High level accidents and work related mistakes can happen due to lack of knowledge among works even in project management. While it is low level of enforcement and regulation considerable for best conditions happen unexpected accidents on site.



Figure 7. A Wide range of workers type Source : Deloitte analysis

For staying safe at work it is obligatory obeying common legislation or enforcement. There is high level of accidents due to implementation of international law and national legislation on human factor. Figure 7 clarifies that dynamics of the anticipated each labor by 2020 relative today.

## What is human error?

Human error is defined by Dhillon as, "A failure to perform a prescribed task or the performance of a forbidden actions." The consequences include serious injury and property damage, less serious injury or damage, and events with no real effect, these can be considered as "Near miss incidents." (Knox ) [26].

## What types of errors do humans make?

It is important to realize that humans will make errors no matter what their level is of skill, experience, or training (Kim) [27]. The working environment effects human reliability and is greatly influenced by equipment design and management policies. A knowledge of the types of errors that will be made is required if accidents are to be prevented.

Norman [28] suggests two ways that human errors occur, mistakes and slips. A mistake is a failure in the planning of a task; a slip is due to the execution of a task, a lapse in concentration. "If the intention is not appropriate, this is a mistake. If the action is not what was intended, this is a slip." Kletz [29] adds violations (a decision is made not to do something) and mismatches (someone is not able to do something), as further types of human error.

Kontogiannis et. al. [30] has summarized the types of errors that humans make. The possibilities can be summarized as doing nothing, doing something wrong, or doing something right but in the wrong place. The main objectivities are as follows:

1. action errors: either no action is taken when required, the wrong action is taken, or the correct action is carried out but on the wrong object,
2. checking errors: when the system requires checks to be made, the checks are omitted, the wrong checks are made, or the correct check is made on the wrong object,
3. retrieval errors: when information is required, either from human memory or from another reference source, it is not received or the wrong information is received,
4. transmission errors: when information has to be passed to someone else, either no information is sent, the wrong information is sent, or it is sent to wrong place,
5. diagnostic errors: when an abnormal event arises, the actual situation is misinterpreted,
6. decision errors: when the circumstances have been considered the wrong decision is made.

ACE Security and Safety Services LLC - Vail, Colorado list the following as unsafe acts that are likely to cause accidents:

1. using equipment without authority,
2. using equipment incorrectly,
3. making safety devices inoperative,
4. using unsafe or damaged equipment,
5. failing to use protective clothing,
6. unsafe handling and storage of materials,
7. working in unsafe environments,

8. moving around in an unsafe manner
9. poor housekeeping [31].

## What factors influence human reliability?

Whilliams [32] has summarized the main causes of human error:

1. unfamiliarity: a situation is important but occurs infrequently or is novel,
2. time shortage: not enough time is available for error detection and correction,
3. understanding: no means available to convey information such that it is easy to understand,
4. "Mental models": the way the operator imagines a system to work is different to how the designer imagined it,
5. information overload: simultaneous presentation of information goes beyond a persons capacity to understand,
6. new techniques: the need to learn new techniques which may follow philosophies opposing those that have been used previously,
7. perceived risk: the actual risks present are greater than the person involved realizes.
8. feedback: system feedback is poor, ambiguous, or inappropriate,
9. conformation: no clear conformation is available from the system of the action that is required to control it,
10. inexperience: the circumstance present requires experience, to understand and control the situation, beyond that of the person involved,
11. information quality: specified procedures, or instructions from other humans, are of poor quality such that they are inappropriate to the situation present when followed,
12. diversity: the system has no diversity to allow checking of information presented,
13. physical ability: the person does not have the physical ability to perform the required tasks,
14. mental stimulation: the person is required to spend a lot of time either inactive or involved in highly repetitive, menial tasks,
15. disruption: work patterns cause disruption to normal sleep and rest cycles,
16. pacing: other people influence the pace at which tasks can be performed,
17. over manning: more people present than required to do the job satisfactorily.

## Human variability

Lee, KW. Tillman, FA. Higgins, JJ list the principle factors that will affect a person's performance as:

1. reaction to stress,
2. fatigue,
3. supervisor's expectations,
4. social interaction,
5. social pressure,
6. group interaction and identification,
7. crew efficiency
8. morale,
9. time at work,
10. idle time,
11. repetition of work [33]

## The prevention of human error by improving knowledge

It has been suggested that human error causes up 80% of all accidents Baron, RG. [34]. Lucas, D. has produced a list of ways to reduce human error as followings [35].

## Motivational Campaigns

This is a system where some-sort of reward is offered for operating in a safe manner. This usually involves analyzing accident rates. The problem with this is that people are effectively punished for the accidents they are involved in thus, rather than reducing accidents, the number of incidents reported is reduced.

## Increased Discipline

Here people are punished for the accidents they are involved in. Once again this is more likely to reduce reporting rather than necessarily the number of accidents. It also requires placing the blame on certain people. Although an operator might have been directly involved, the accident is more likely to have been caused by latent human errors which may not be so obvious and are out of their control.

## Safety Audits

These will generally be regular checks made by independent assessors covering a wide range of safety features. They provide a good indication of the obvious problem areas and hazards. The problem is that they will generally be limited to a check list of items thus the problem of identifying critical factors may not be fulfilled.

## Increased Automation

Here human manual control is replaced by automatic controls, generally electronic devices. These devices will do as instructed without the problems of human variability and unpredictability. The problem is that automation will generally make the system more complex and introduce more latent error, accidents waiting to happen. With a high amount of automation, the human has different tasks to perform. They are basically there to deal with unforeseen circumstances or to perform tasks that the designer cannot automate.

## Improved Training

Training is very important in the effort to reduce human errors and hence accidents. Safety training is vital for everybody involved in the system. Operator training will not, however, improve reliability when the root cause is bad design or poor management. Personnel performance checks and evaluations should be used and good, constructive feedback given at regular intervals. Refresher training should also be used to prevent behavior patterns building up such that variations of equipment and procedures cannot be handled [36].

## Redesign the Job, the Equipment, or the Procedures

This really is the main way to reduce accidents caused by human error. A simpler job will reduce confusion, reduce stress and mistakes will be less likely. Human errors will still occur but improved equipment design minimize the consequences. The ability to control dangerous situations, however, is vital. This requires plenty of useful, easy to interpret, information.

## Findings

1. Human capital proportion is direct correlation with human develop index in level of the economic development of the countries;
2. Research statistics show that even highly monitoring construction industries like UK, US and other still occur major accidents;
3. By implementing international standards in Health and Safety can be achieved low accident rates in construction industry;
4. Human errors is continuous in progress both negligence and knowledge factor;
5. Innovative approach is an only way reducing human errors by improving theory and practice at work place.

## Conclusion

The high level of accidents in a complex and consistent problem building industry is still in danger. This situation has encouraged factors that influence of legislation and inspecting on site cannot reduce accidents into Zero Rate. However, talking all workers whether experienced or not is remaining problematic because relationships and perceptions in this attitude getting too difficult to change on site. As a solution is using strictly inspection and fining system into sector. Over the past five years, there were many super-protected workers took place incidents in Uzbekistan. Offered seven factors that affect tendency of the building worker to combat the risks has been successfully identified in future. Every factor and this study has shown that semi-professional expertise is a pragmatic approach to interviewing to deepen the understanding of building workers' risk-management. By this way value of the human capital can be reach in international level.

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