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A Research on Failure of buildings in the Construction Industry of Kenya

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Importance of the Construction Industry: GDP Input

- ❑ Kenya's construction industry is a key driver to the country's economic growth. It contributes greatly to the country's Gross Domestic Product (GDP).
- ❑ The Kenyan construction sector was valued at USD 3.53 billion in 2015.
- ❑ The sector is expected to grow at an average compound annual growth rate of 6.8% to 2020.

Current legal framework for construction industry



Physical planning
Act

County
Government
Development
Control

NCA and other
regulatory
agencies e.g.
NEMA, DOSHS
etc.

Professionals
through various
Acts

Building failure & building collapse

Building collapse

A phenomenon that occurs when a building loses its ability to perform its intended design function

Building failure

The ultimate and most serious result of failure of a built structure

Impacts of Building Failure

Loss of Environmental Integrity

Loss of lives and property

Damage to corporate image

Problem statement

- Investigate persistence of failure or collapses of building in Kenya
- Elimination of building failure and collapses in Kenya is a matter of national concern

Objectives

- Investigate failure to enhance regulatory control of construction activities at the site, project, firm and industry level in the country
- Describe building failures and their determinants
- Establish relationship between building failure and their determinants
- Synthesize a framework for effective regulatory control of construction

Literature Review

- Literature review shows building failure broadly influence by 7 explanatory variables
 - Technical,
 - finance,
 - institutional,
 - legal
 - ethical factors
 - Welfare
 - Unforeseen forces
- Variable conducted from 66 surrogates identified from various researches previously done

Assumptions

- ❑ Industry players may not precisely measure unsuitability of variables.
- ❑ However their industry experience and intuition regarding project circumstances are realistic pointers to ‘underlying infection’ in the building project system which eventually leads to collapse
- ❑ Building failure and collapse are related. The larger the probability of Failure the larger the probability of collapse
- ❑ Growth/urbanization will continue

Methodology

- ❑ Desk study and historical data
- ❑ The Survey target was 47 counties however data collection took place in 43 counties leaving 4 counties due to logistical and practical reasons
- ❑ The target sample was 500 construction projects
- ❑ The survey was able to realize 81% response rate (403 sites)
- ❑ FGDs were conducted in Kisii, Nairobi and Machakos
- ❑ Interview with policy makers and Industry regulators

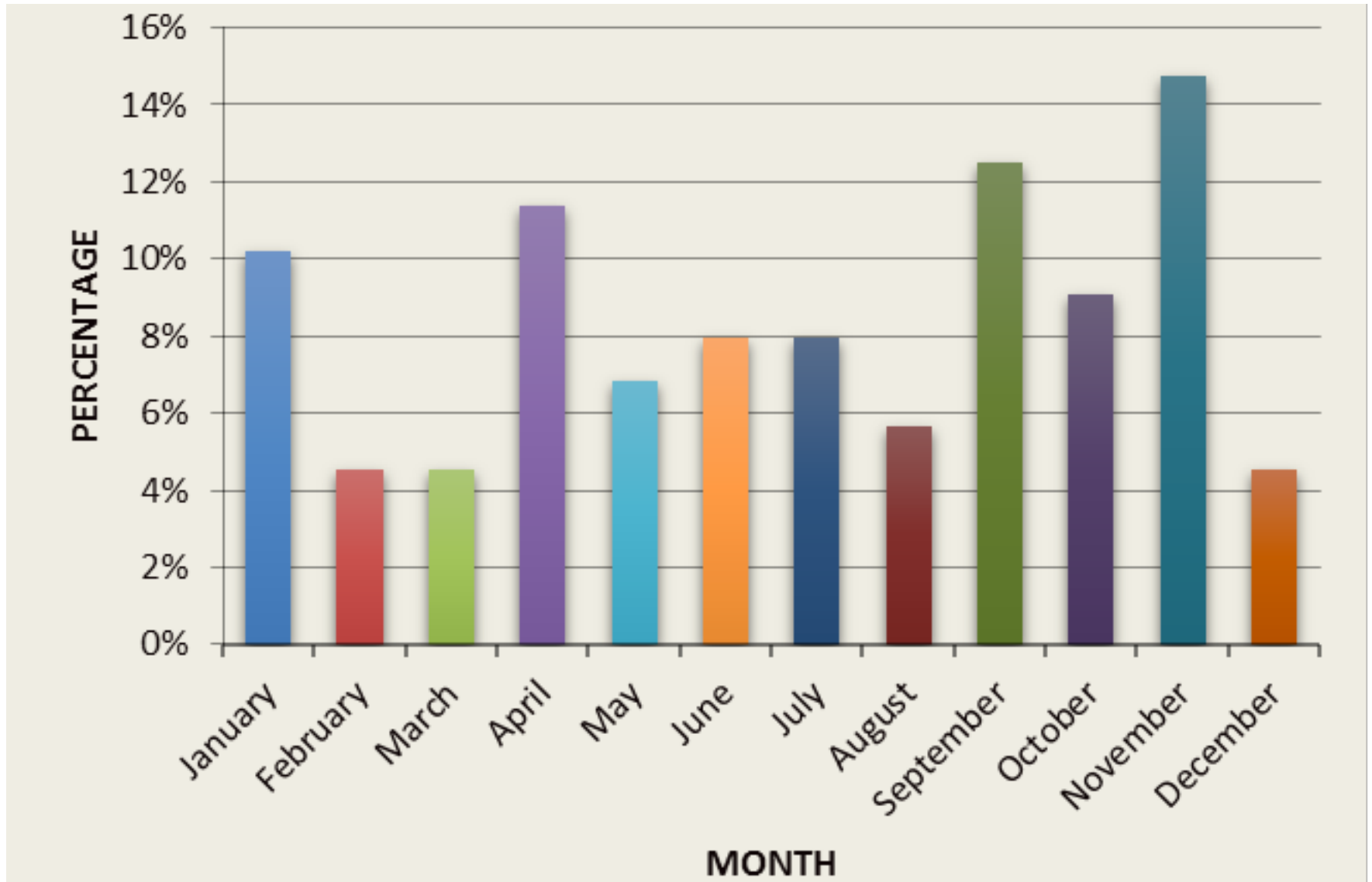
Trend line of Collapse of Buildings; 1990 to 2018



Trend line of Collapse of Buildings; 1990 to 2018

Source: Constructed from the NCA Data Base, 2018 as at March 2018

Monthly frequency of building collapse in Kenya; 1990 to 2018

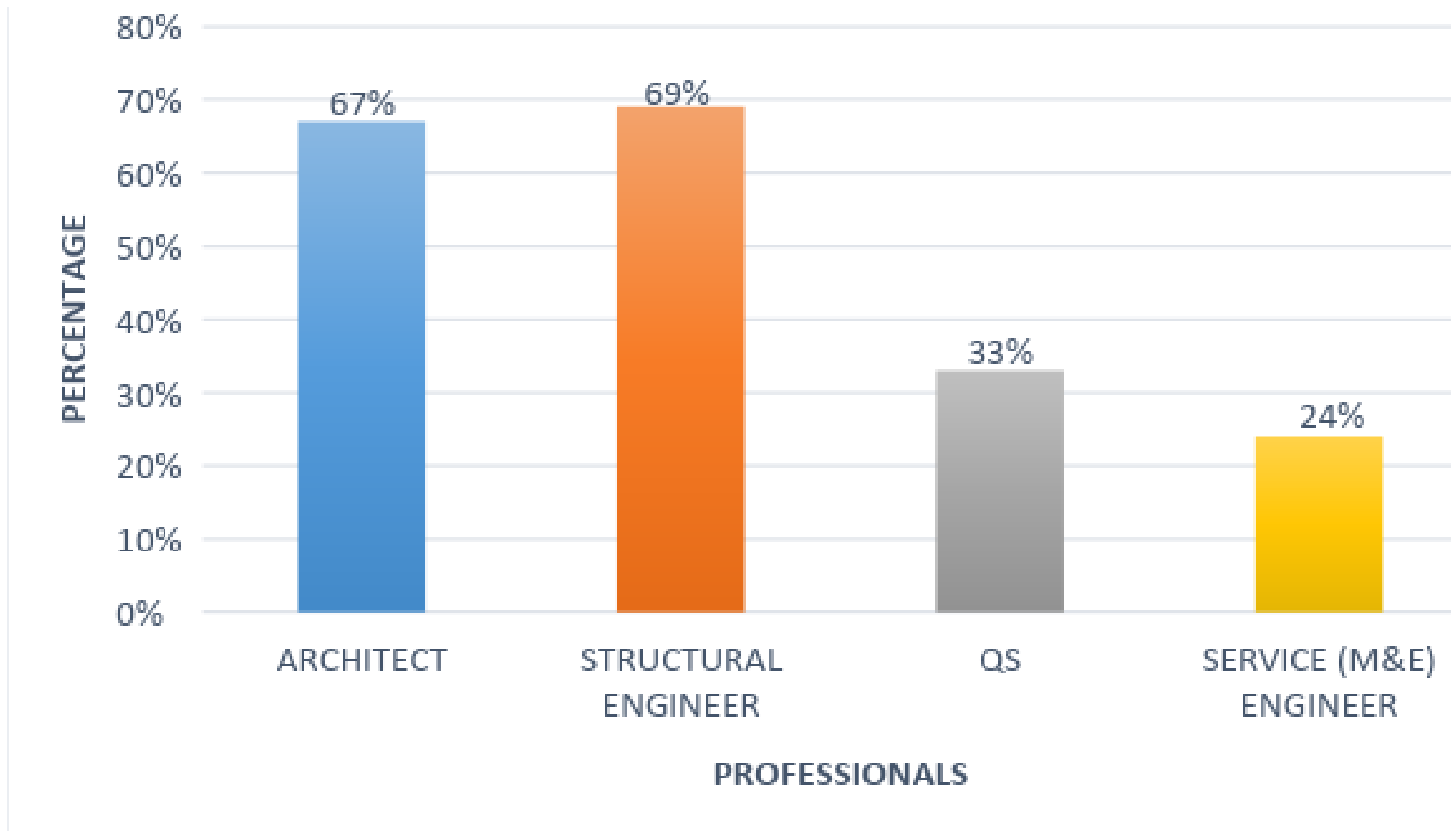


Monthly Frequencies of Collapsed Buildings in Kenya

Source: Constructed from the NCA Data Base, 2018 as at March 2018

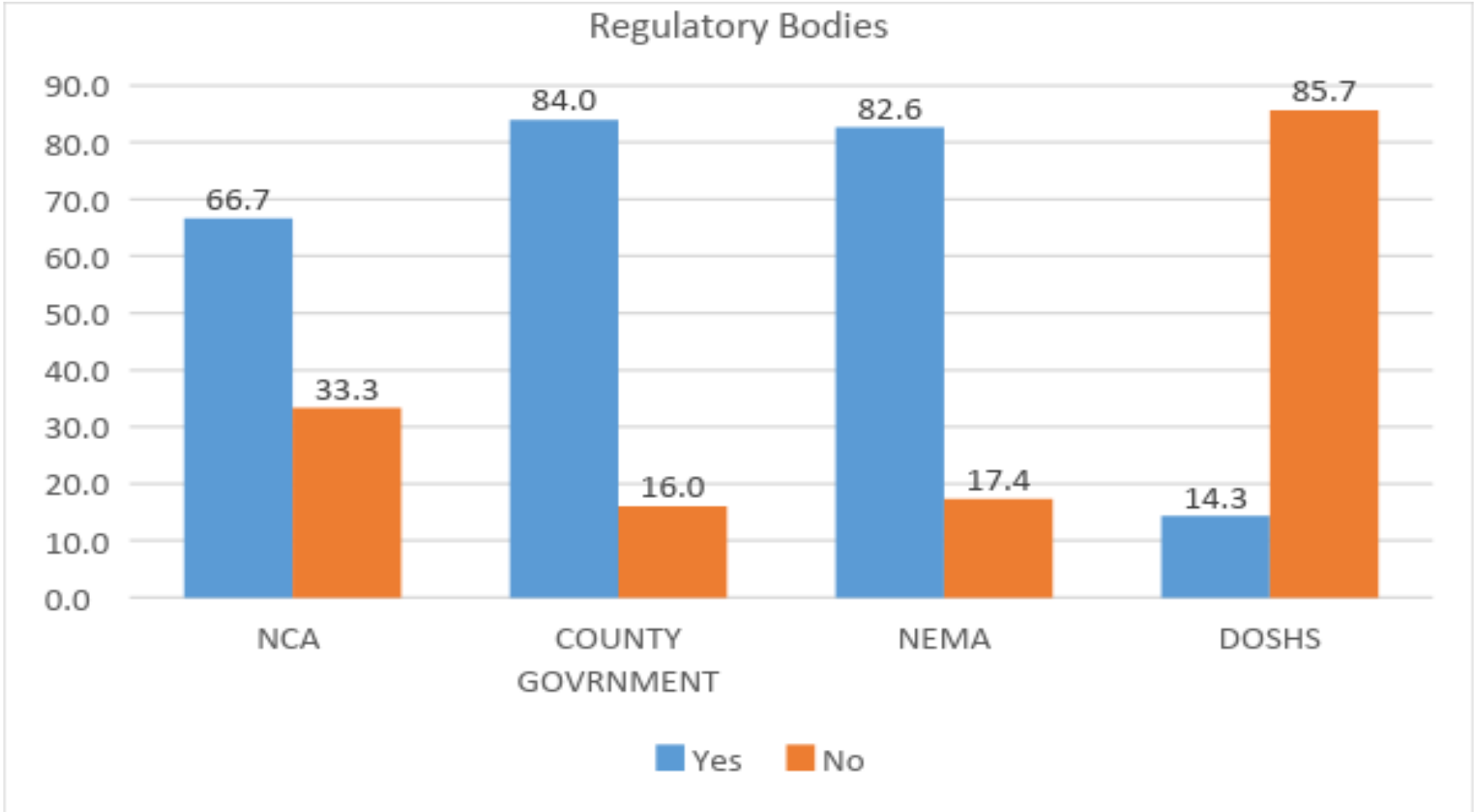
Probability of failure in the functional performance of the building

- ❑ Analysis of data collected showed that the average probability of functional failure in the population from which the data was collected is 0.35 and any scores above this level implies that the building has a relatively higher risk of functional failure.
- ❑ Technical, finance, institutional, legal and ethical factors on observed sites were generally inadequate
- ❑ Welfare and unforeseen events were generally adequate
- ❑ Relationship between building failure and the 7 variables is neither linear nor direct. It is more complex than earlier postulated.



Bar Chart of the Professionals in the Projects

Professional involvement: probability of failure remains high where professionals have been excluded



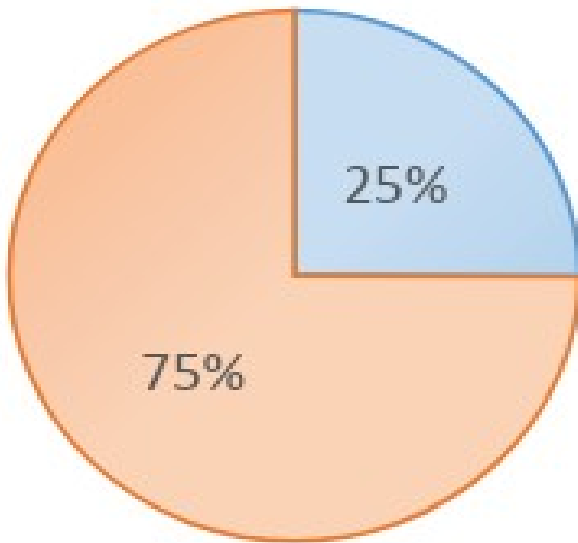
Bar Chart of Compliance to Building Laws and Regulations

- Respondent did not consider non compliance to DOSH on site to be serious

Quality assurance in construction sites

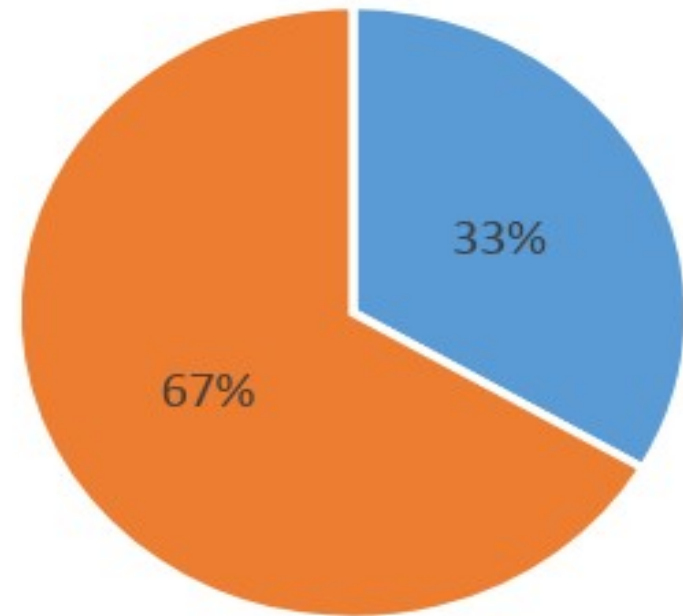
- Reinforcement bar test records: 25 % of sites had records of Rebar tests
- Concrete test records: 33% had evidence of concrete tests

Re-bar test



■ Yes ■ No

Concrete test



■ Yes ■ No

Some Key reasons for collapses cited over the 20yrs period

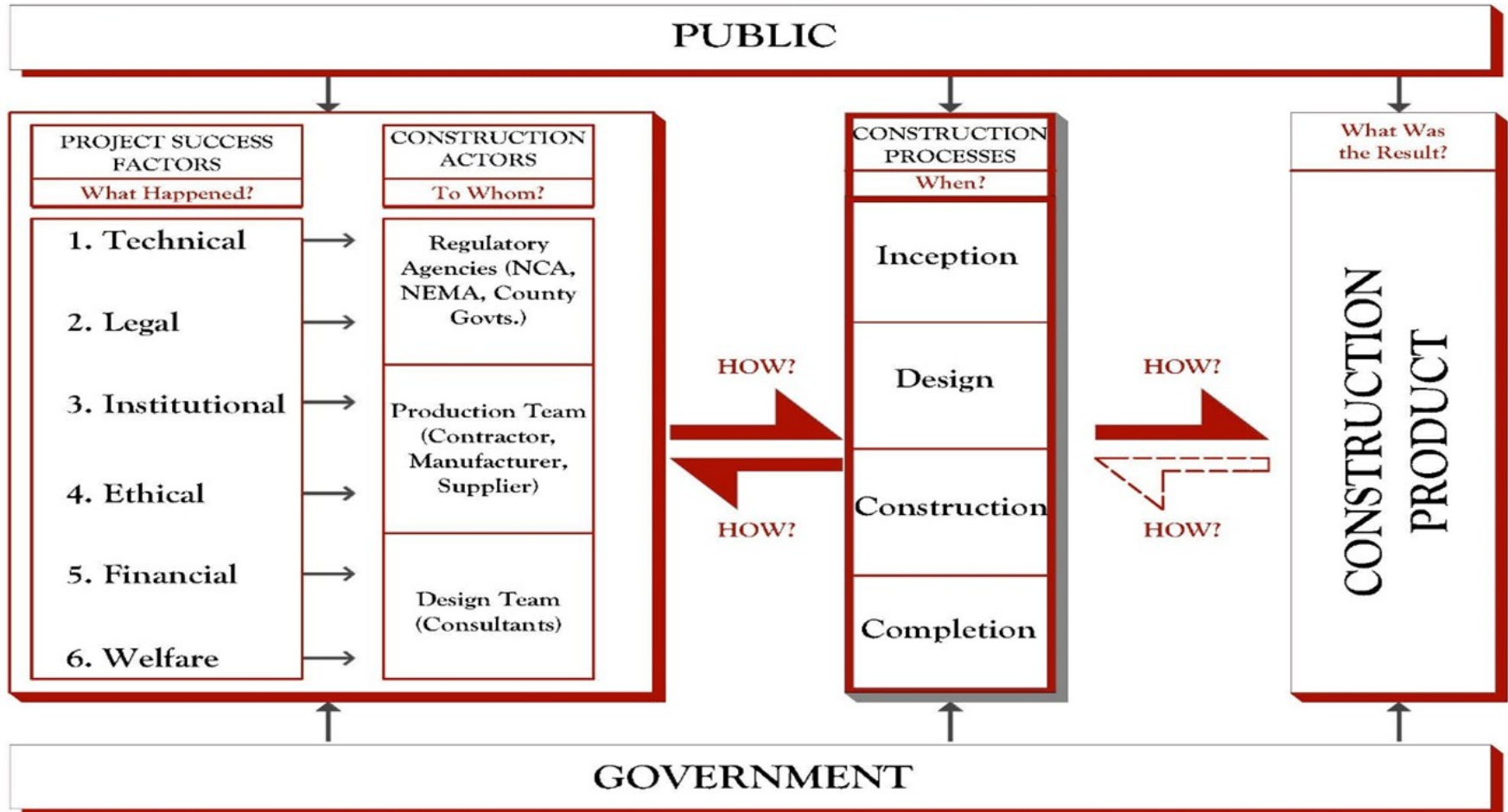
- Lack of project consultant
- Poor workmanship
- Poor usage of materials (overloading slabs)
- Substandard materials
- Heavy rains
- Non adherence to safety regulations
- Strong winds
- Poor designs
- Lorry rammed into building

- Excavations with no regulations
- Poor skills
- Loose soils (poor foundations)
- Building on riparian
- Frost action
- Cracks on wall
- Low compliance to laws
- Lacks of NCA contractor
- Excavations with no regulations

Recommendations

- Overarching framework to engender collaboration amongst all professionals and development control agencies (one stop shop for approvals and revenue collections)
- Increase financing and structured capacity building to grow the sector
- Stakeholder engagement for construction project performance
- Decentralization of industries and settlements thus improved means of transit for person, good and services
- Enhancing capacity for internal audits to rein on lethargy and corruption
- Encourage professionals to give back to the society through pro bono services to promote social good and complement government effort
- ***Institutional set up needs re-engineering to inter alia, eliminate duplicity and overlap of functions in the construction industry***

An Integrative Framework for the Construction Process and Regulatory Framework



Recommendations

- Embrace ICT in the whole construction cycle
- Technical and legal reporting of collapses to be streamlined.

Legal:

- Imposition of penalties on defaulters
- Breach of duty causing death be penalized
- Developers who do not declare project be penalized
- Amend the Physical Planning Act to include for towns and country planning
- Amend of the Insurance Act (CAP 489) of the laws of the Kenya to introduce Construction and Engineering Insurance
- National Government to cascade building laws for endorsement and enforcement by the County governments

Recommendations

Institutional

- Regulatory agencies should employ adequate professional staff
- Downward review of approval charges, levies and timelines, levies and timelines(standardized across counties)
- Mobile software application for public reporting of construction malpractices
- Establish a well equipped rapid disaster management team
- License building inspectors for external inspection of works

Ethical

- State Department for Social Engineering should be created to deal with malpractices
- Barazas should be established in every county to deal with construction malpractices

Recommendations

Welfare

- incentives for developers and contractors
- Promote resident association in quality assurance
- Worker compensation scheme to be enhanced to encourage construction workers

Financial

- Improve capacity of field officers
- Developers to take insurance cover for construction projects
- Approval fees and levies to be standardized across counties
- Govt. to act as an enabler for mechanization