LESSONS LEARNED

HUMAN FACTORS IN AVIATION ACCIDENTS

- SIMILARITIES BETWEEN AVIATION SYSTEMS AND HEATHCARE SYSTEMS
- ACCIDENTS HAPPEN
- SCIENCE AND KNOWLEDGE BASED OPERATIONS
- COMPLEX ADVANCED TECHNOLOGY
- HIGHLY SKILLED PERSONNEL
- HUMAN FACTORS ASPECTS
- CULTURAL ASPECTS

Human Errors or Factors

Human errors are symptoms of a *mismatch* between humans, hardware and the operating environment

In aviation, as in other complex technologies, we are in the *age of the organizational accident*

Organizational accidents are accidents in which *pre-existing* and often *long-standing factors* or *failures*, arising in the organizational and managerial sectors combine with *local triggering conditions*, to *penetrate or bypass* the system's multiple defenses

Organizational Factors

Organizational factors are the *macro factors* that affect safety in an aviation organization

Every flight deck, maintenance hangar, dispatch office and control tower is a *microcosm*.

In the past, human factors studies have concentrated on the *interactions between human and machine.*

Yet the arenas in which piloting, maintenance, dispatch or air traffic control takes place are *shaped by managerial decisions*.

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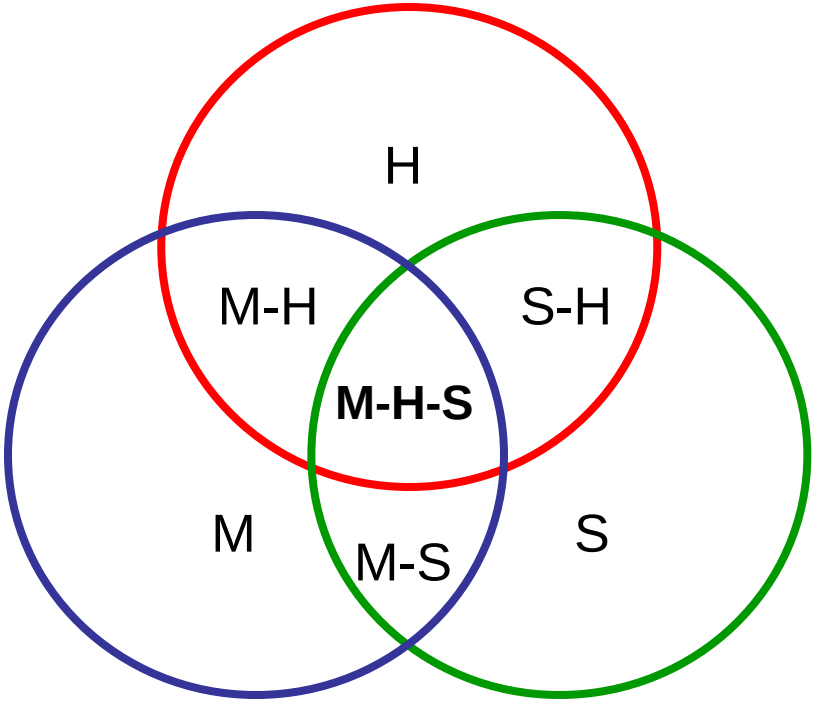
Front End Managers

Pilots, dispatchers, maintenance and traffic controllers *are the last links in a chain of unsafe practices*.

The *decision makers* — remote in time, space or organizational linkages — set the stage: *these decision makers put the actors in place* and *choose* the facilities they will use for their performance.

The Human, Software, and Machine Interconnectivity



The SHEL Model

First advocated by Elwyn Edwards (1972)

Four Elements:

- Software

  organization, procedures, rules, regulations, symbology, etc

- Hardware

  machines, equipment, etc

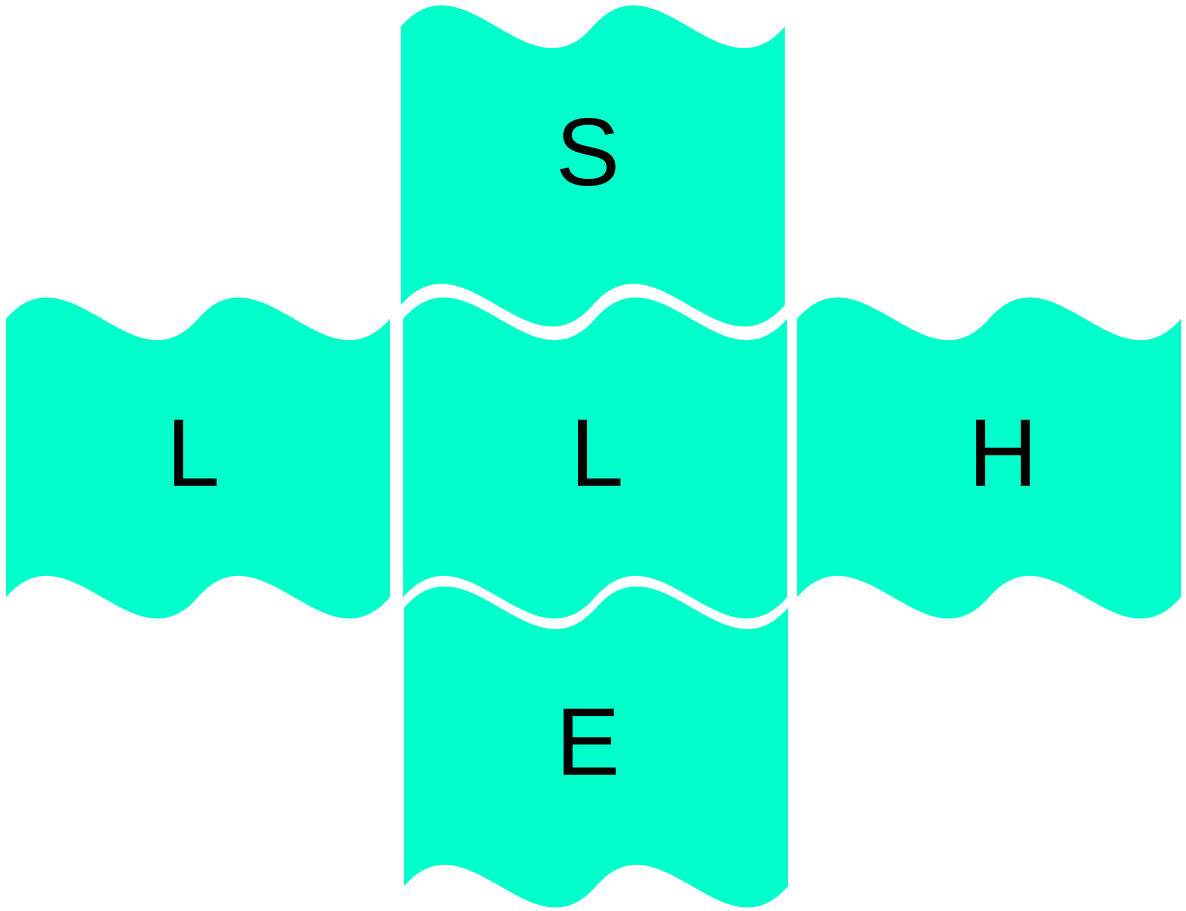
- Environment

  living environment, economic, social, politics, culture, etc

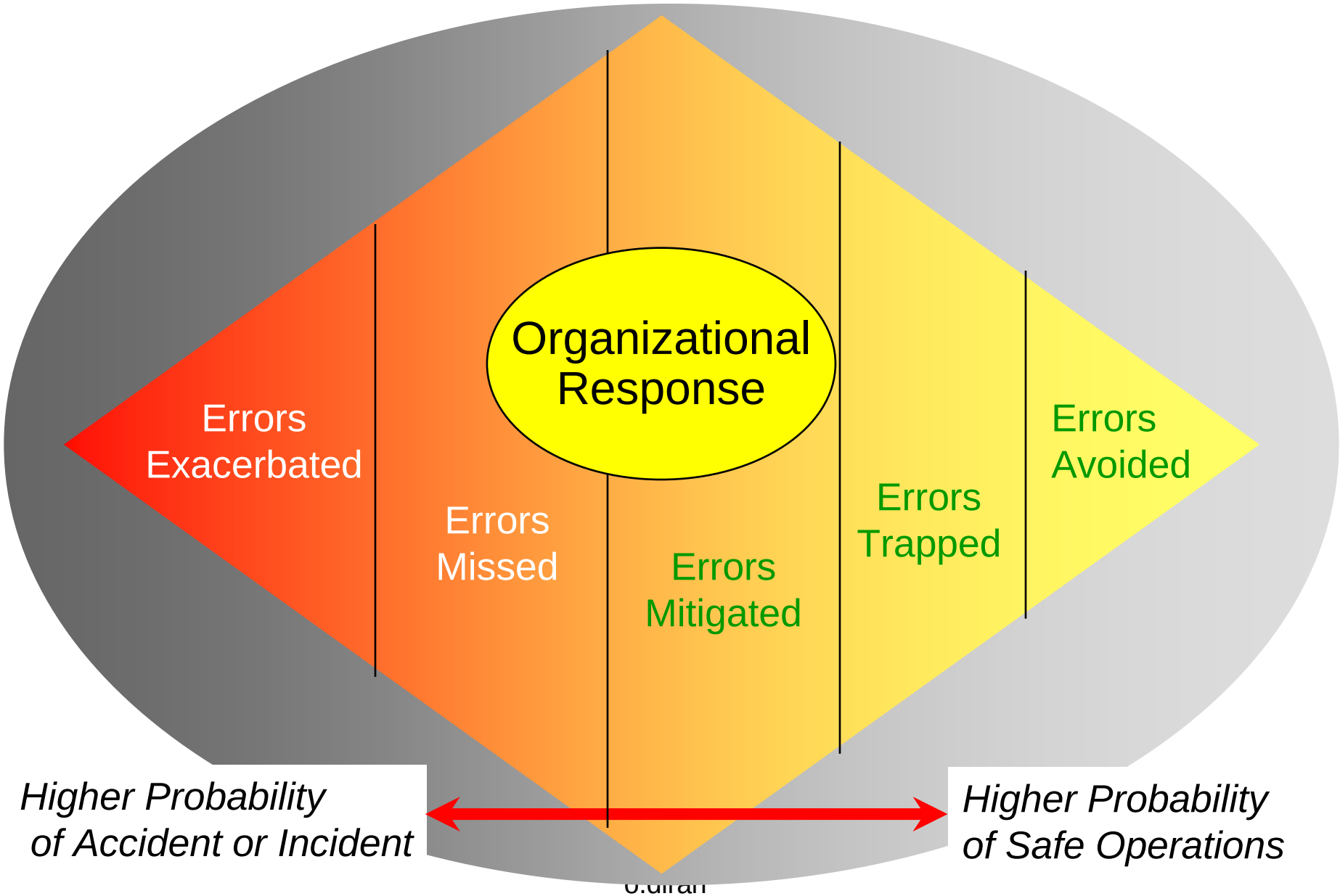
- Liveware

  humans

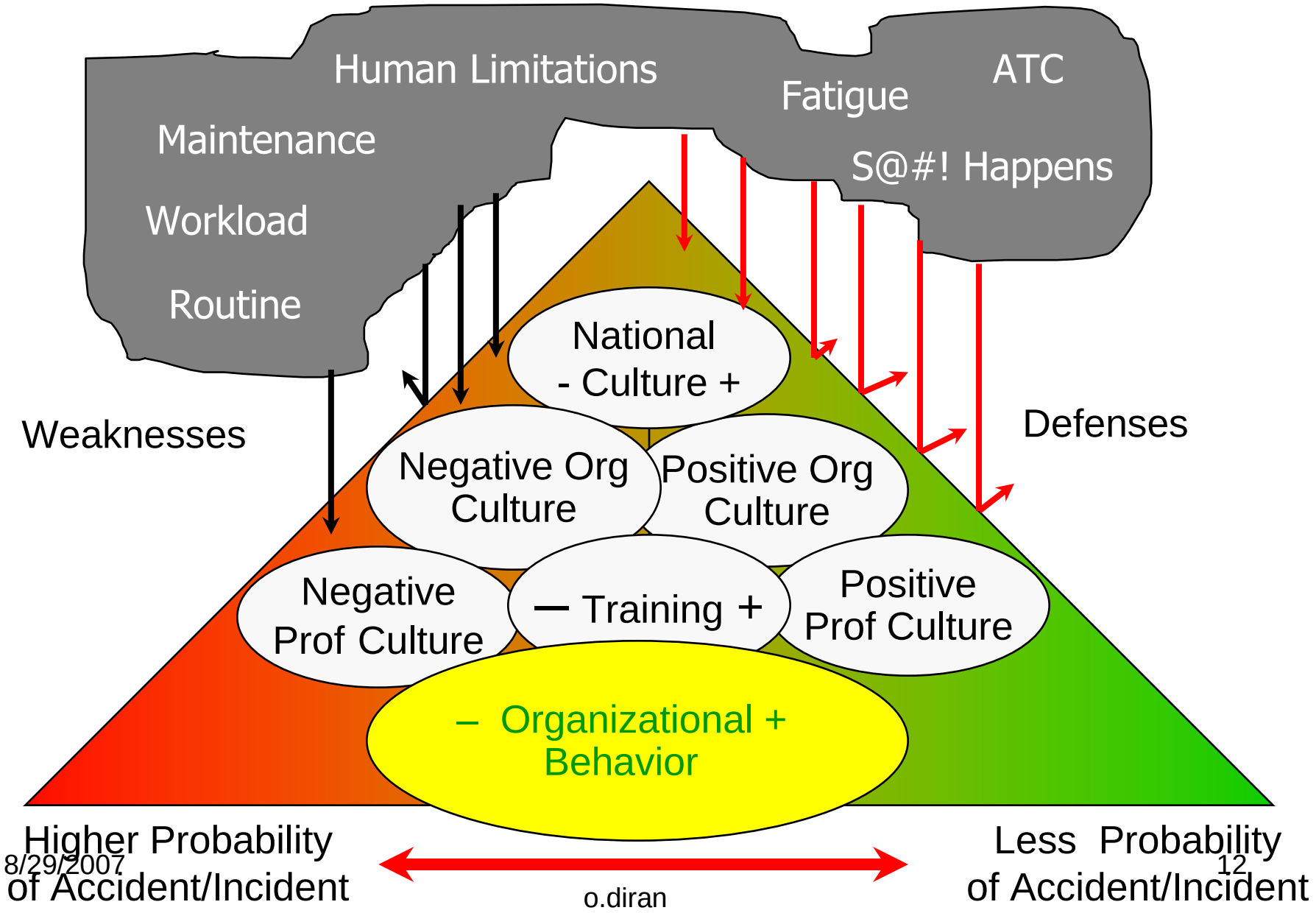
SHELL MODEL



Pursuing Error Management



Defenses Against Error



Reason Model of Failures

ACTIVE FAILURES

An active failure is a result of an action or decision which has an immdediate adverse effect

LATENT FAILURES

A latent failure is a result of an action or decision made well before an accident

Active and Latent Failures

- Failures will happen.
- Active failures have an immediate and direct impact
- Latent failures may lie dormant for long periods, before they combine with active failures and local triggering events to breach the system’s defences.

Active and Latent Failures

- Active failures are committed by those in direct contact with the system (pilots, air traffic controllers, maintenance personnel).
- Human active failures are errors or violations committed by those at the sharp end of the system.
- On some occasions they may occur in conjunction with a breach in the defences and caused an accident
- Sometimes active failures may affect and weaken the defences

Active and Latent Failures

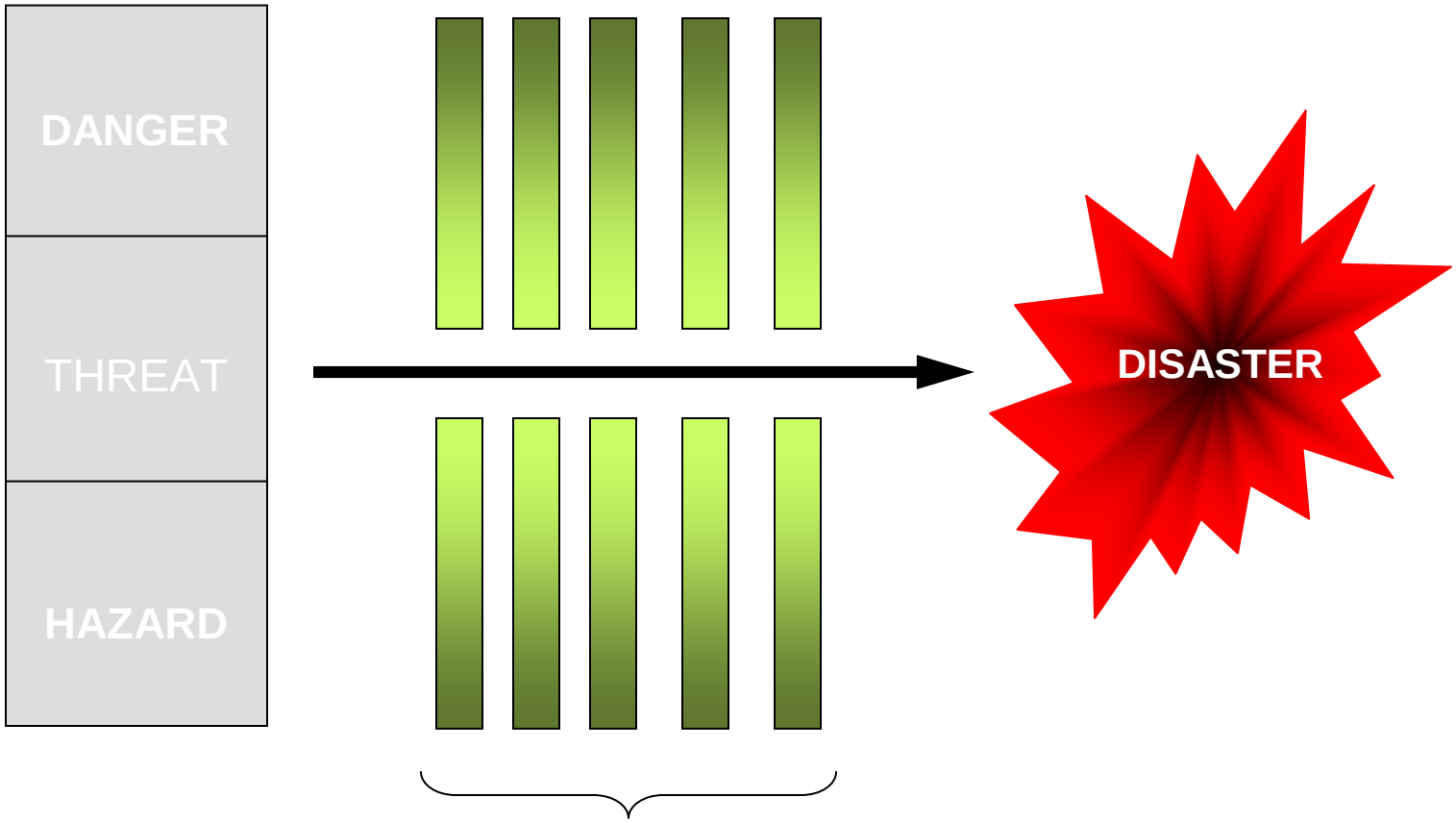
- Latent failures derive from decisions taken in the managerial and organizational spheres
- Latent failures are loopholes in the system's defences, barriers and safeguards whose potential existed for some time prior to the onset of an accident sequence.
- These weaknesses may combine with both active failures or local triggers or both to create a trajectory of accident opportunity through some or all of the system's protective layers
- Latent failures are usually discovered once a defence or barrier has failed.
- However, latent failures can be assessed proactively

Reason Model of Failure Modes

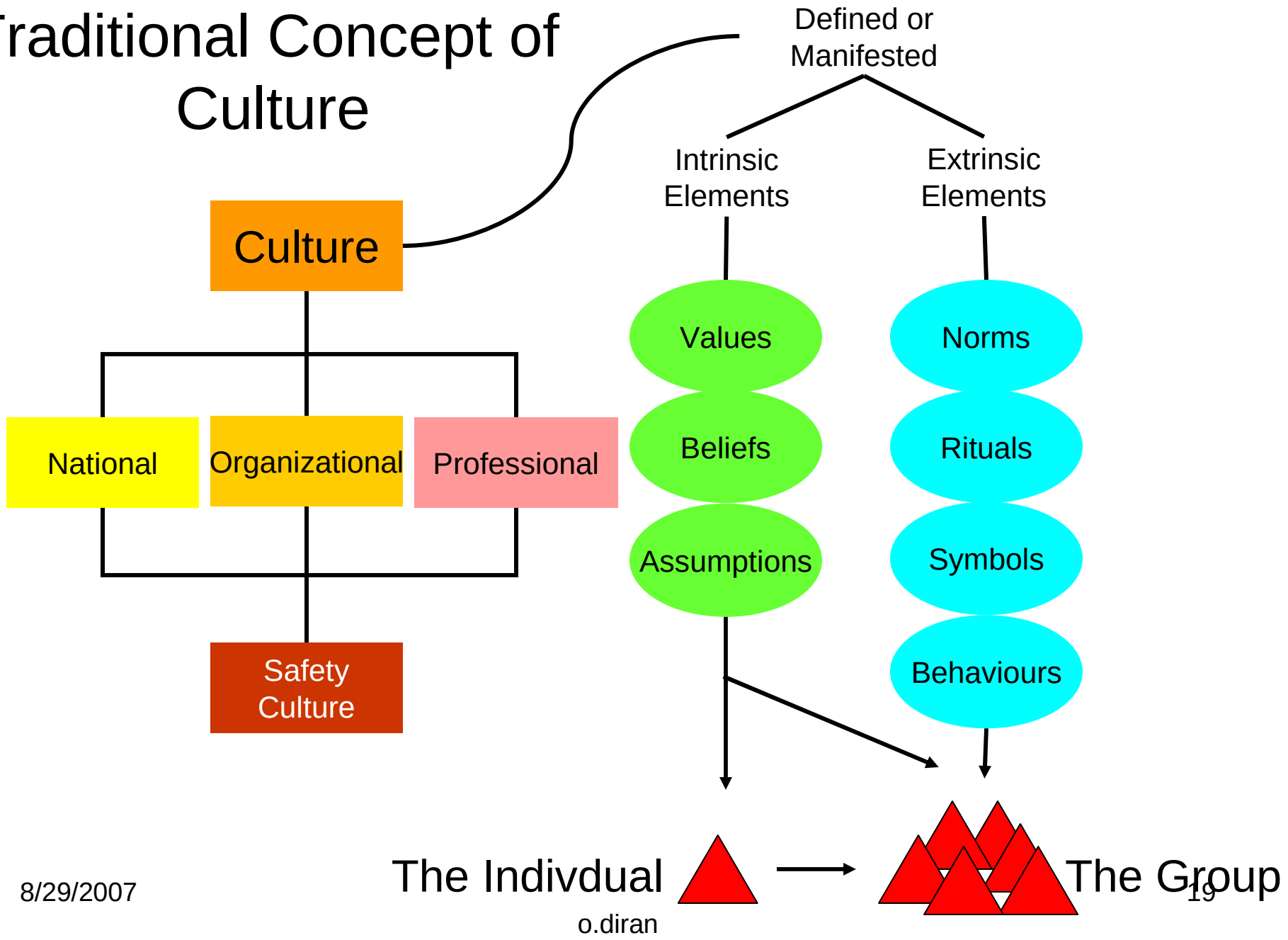
DECISION MAKERS	Latent
LINE MANAGEMENT	Latent
PRECONDITIONS	Latent
PRODUCTIVE ACTIVITIES	Active
DEFENCES	Latent / Active

Reason, J., Human Error, Cambridge Univ ersity Press, 1990

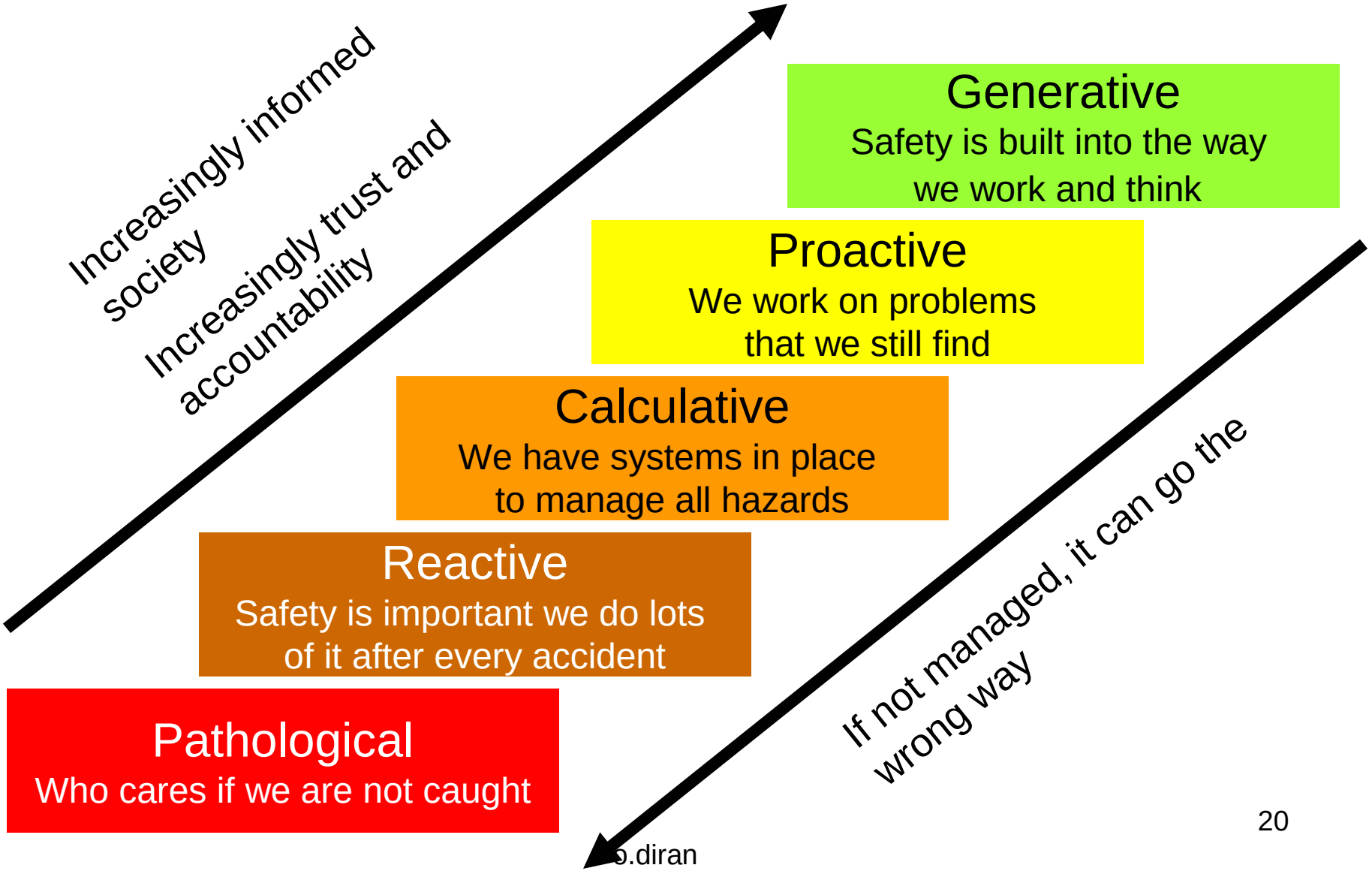
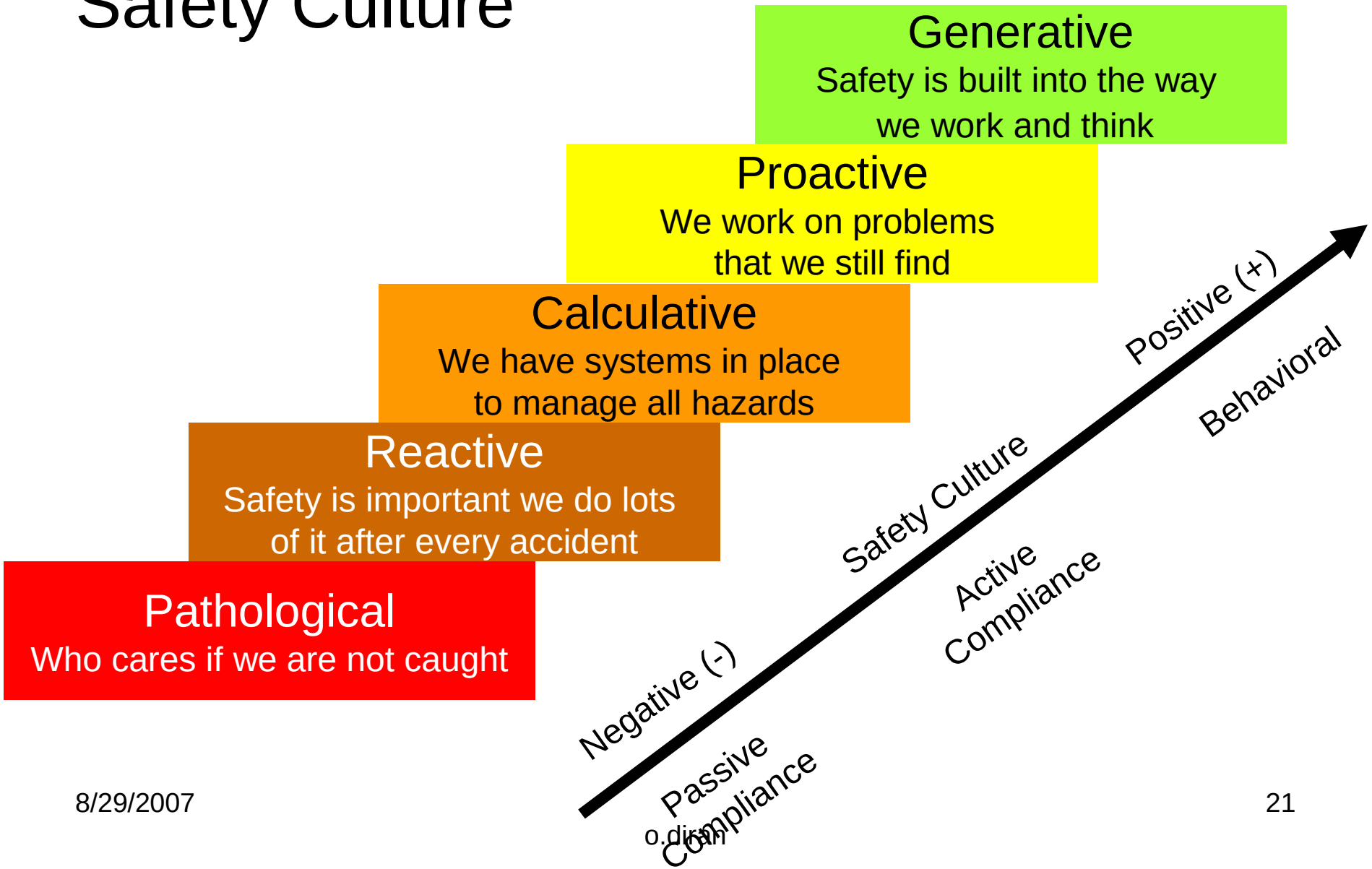
ACCIDENTS



Traditional Concept of Culture



Styles of Safety Culture



Organizational Evolution tied to its Safety Culture