

Bridging railway safety management systems gaps: from theory to practice



Sma Ngcamu-Tukulula (CPE, MSc Ergonomics)
Human Factors/ Ergonomics Specialist at SMART ERGONOMICS

Presentation Overview

Bridging the railway safety management systems gap: from theory to practice

1. Safety management systems in the SA railway industry
2. Evolution of the SMS
3. Gaps in railway SMS as prescribed vs SMS as implemented
4. Moving towards creating better alignment between the SMS as prescribed vs SMS as implemented
5. Q & A

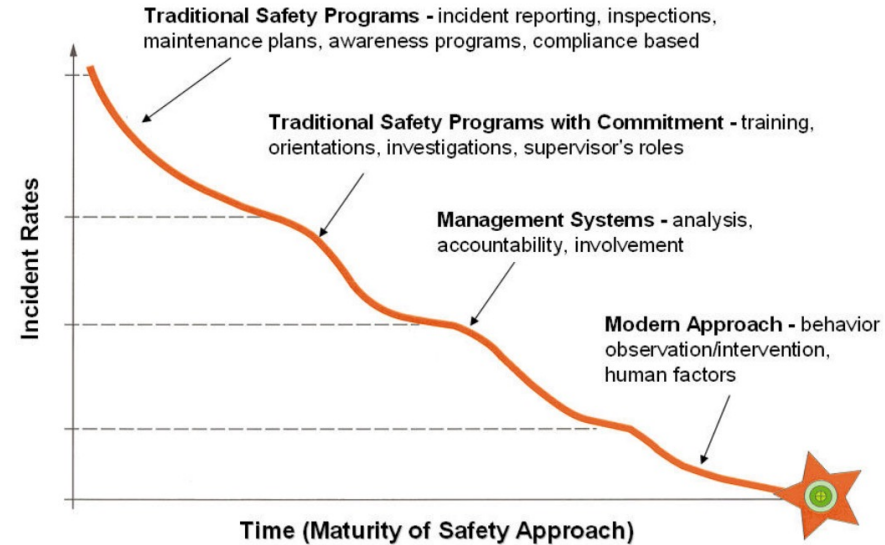
Safety management systems in SA railway industry

- SMS is a systematic approach to managing safety including the necessary organisational structures, accountabilities, policies and procedures (ICAO, 2009). A structured framework for the management of safety in daily operations across the system (i.e. a planned, documented and verifiable method of managing hazards and associated risks).
- Systems based approach to safety management:
 - Recognises that the complexity of railway systems and the interconnectedness of all elements within the SMS
 - Incorporates the management of safety across the life cycle of the system/ railway organisation
- SMS and railway legal requirements
 - SMS mandatory for railway organisation applying for, and maintaining safety permit (NRSR Act, SMS Determination) and further substantiated in SANS and RSR standards
 - Having an SMS is regarded as best practice across various safety critical and high reliability industries including railway organisations internationally



Evolution of the SMS

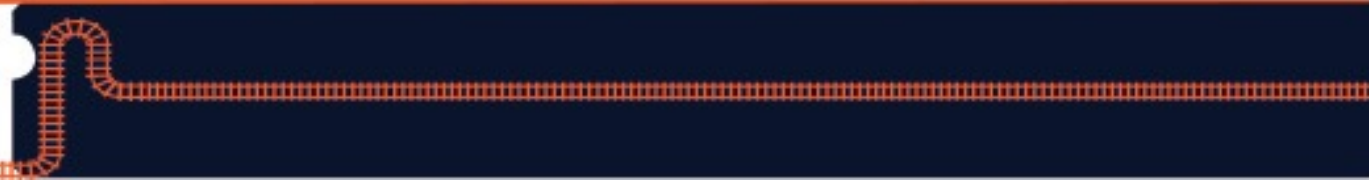
- Safety managed through organisations complying to prescribed minimum safety requirements set by relevant authority = driven by safety oversight activities
- Major accidents occurred despite organisations complying to minimum requirements → compliance doesn't account for management of all risks in complex systems
- Regulatory reform → shift from compliance to minimum requirements to focussing on assessing the extent to which organisations are managing their risks (i.e. responsibility shifted to organisation's managing their unique risks beyond compliance) (ATSB, 2011)
- SMS → a collection of best practices for management of safety, continues to evolve as new approaches are developed



Safety management systems in SA railway industry

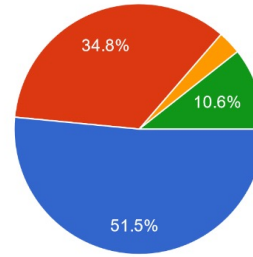
OBJECTIVES OF SMS: THEORY vs. PRACTICE

- Well implemented SMS = enable organisations to meet business objectives (productive, reliable, safe operations)
- SMS benefits not always achieved by railway organisations in SA industry
 - Are there deficiencies in the prescribed SMS?
 - What are the barriers to implementing SMSs?
 - How can we bridge the gaps and create better alignment between the SMS as prescribed vs. SMS as implemented



Are there deficiencies in the prescribed SMS?: theory vs. practice

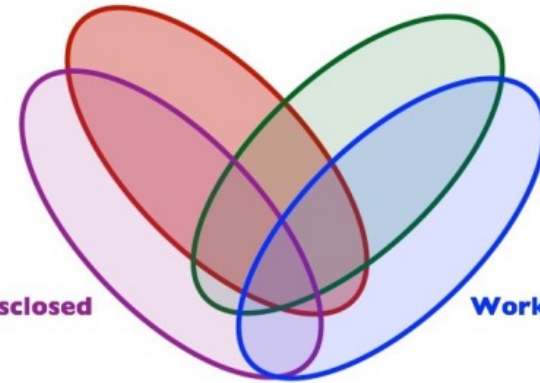
- Collection of basic requirements outlined in current SMS are aligned to international best practice
- Deficiencies lie in misalignment between the SMS as prescribed (e.g. SMS Determination) vs. SMS as implemented (actual operations) SMS as disclosed (e.g. SMS Report, SPCAM)



- The information that is documented in the SMS report is ALIGNED/ THE SAME as in practice/ reality
- The information that is documented in the SMS report is MOSTLY ALIGNED/ THE SAME as in practice/ reality but t...
- The information that is documented in the SMS report is FAR REMOVED/ VERY DIFFERENT from what is practi...
- I am not sure

Work-as-Imagined

Work-as-Prescribed

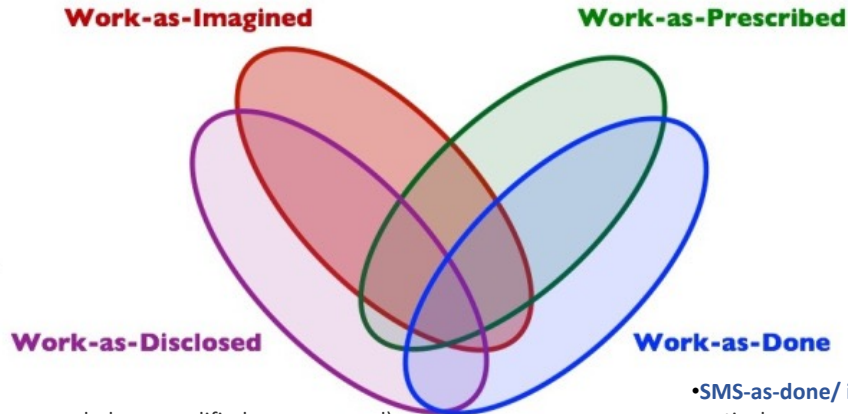


Work-as-Discovered

Work-as-Done

Are there deficiencies in the prescribed SMS?: theory vs. practice

• **SMS-as-imagined** is both the work that we imagine others do and the work that we imagine we or others might do, currently or in the future.



• **SMS-as-prescribed** is the formalisation or specification or documenting of work-as-imagined (laws, regulations, rules, procedures, checklists, standards, job descriptions, management systems, checklists, job description).

• In most current industrial processes, strict adherence to preestablished action guidelines is unattainable, incompatible with the real efficiency targets, and insufficient to control abnormal situations.

• **SMS-as-disclosed** (or -explained, -expounded, -exemplified, or -espoused)

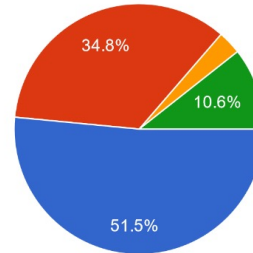
- What we say or write about work, and how we talk or write about it. Tailored to what is thought to be palatable, expected and understandable to the audience.
- It is often based on what we want and are prepared to say in light of what is expected and imagined consequences.

• **SMS-as-done/ implemented** is actual activity - patterns of activity to achieve a particular purpose in a particular context

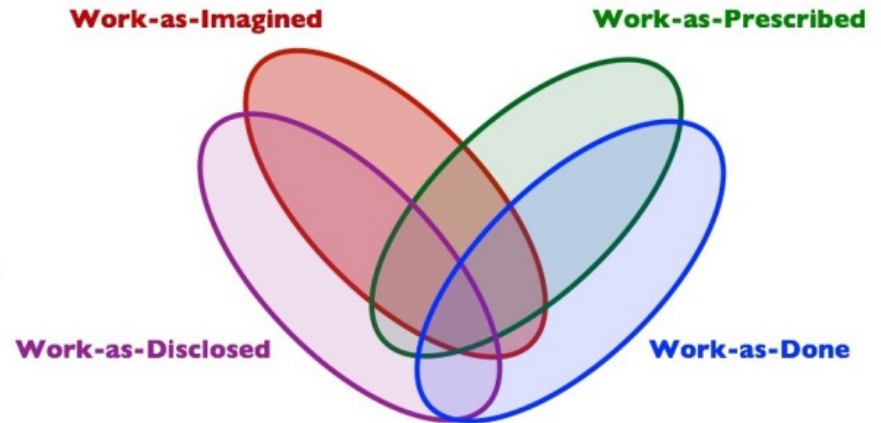
- Achieved by adjustments, variations, trade-offs, compromises that are necessary to meet demand. These adaptations are based on operational know-how, but often have not been subject to formal analyses such as risk assessment; such analysis struggles to handle them. While the adaptations are often necessary to meet demand, they can sometimes put the system and practitioners at risk.

Are there deficiencies in the prescribed SMS?: theory vs. practice

- Collection of basic requirements outlined in current SMS are aligned to international best practice
- Deficiencies lie in misalignment between the SMS as prescribed (e.g. SMS Determination) vs. SMS as implemented (actual operations) SMS as disclosed (e.g. SMS Report, SPCAM)
- While complete alignment may not be attainable in environments where risks are dynamic, it is necessary to improve alignment between the different varieties of work/SMSs



- The information that is documented in the SMS report IS ALIGNED/ THE SAME as in practice/ reality
- The information that is documented in the SMS report is MOSTLY ALIGNED/ THE SAME as in practice/ reality but t...
- The information that is documented in the SMS report is FAR REMOVED/ VERY DIFFERENT from what is practi...
- I am not sure



Selected barriers to effective implementation of SMS

- Disproportionate focus on accidents and incidents instead of the normal day to day performance

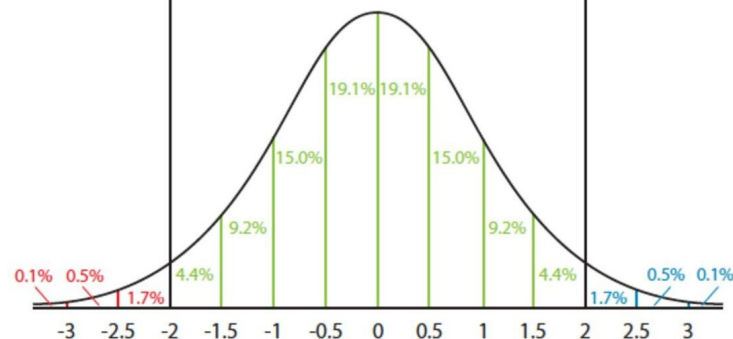


Hollnagel and Shorrock (2013).
From Safety-I to Safety-II: A
White Paper

Accidents & incidents:
obvious internally and
externally, investigated in
depth

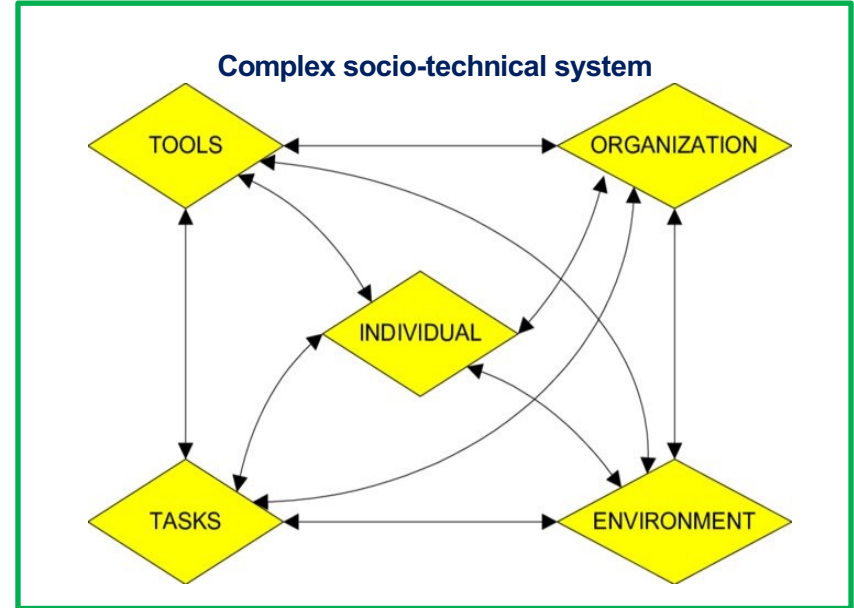
**Normal, routine, day-to-day
performance:**
not well understood, generally
ignored

Exceptional performance:
obvious internally, hard to
see externally, gratefully
accepted



Selected barriers to effective implementation of SMS

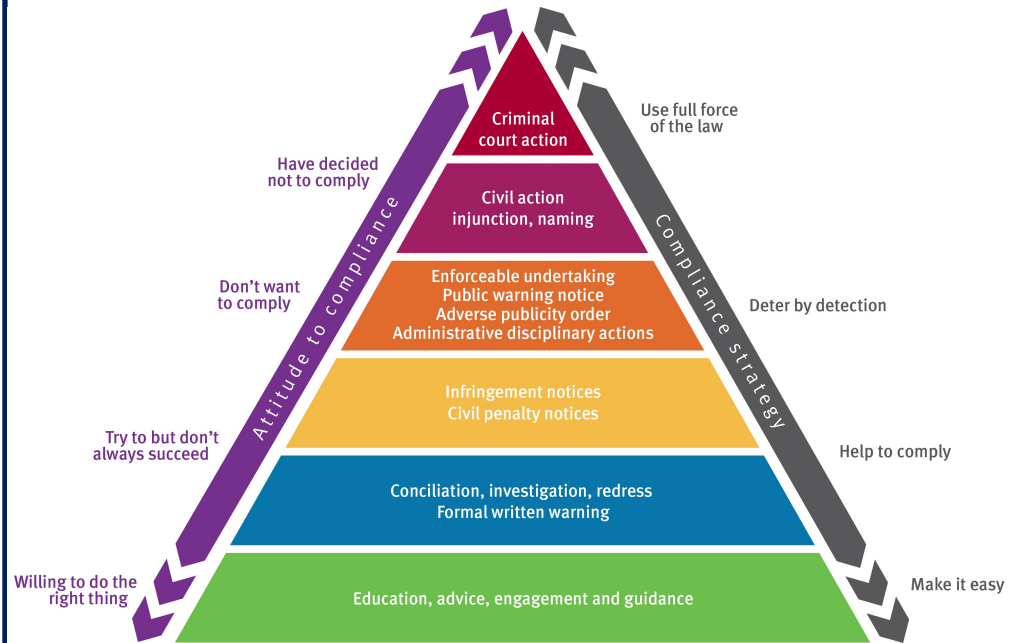
- Disproportionate focus on accidents and incidents instead of the normal day to day performance
- Operators perceive their systems to be “perfect or resilient” with the humans being the source of deviations/ unwanted events/ poor performance
 - People create resilient and reliable systems because of their adaptability to dynamic work demands and emergent risks in the system
 - Design SMS with users in mind vs. retrospectively force-fitting them into sub-optimal systems



Work System Model (Carayon & Smith, 2000; Smith & Carayon-Sainfort, 1989)

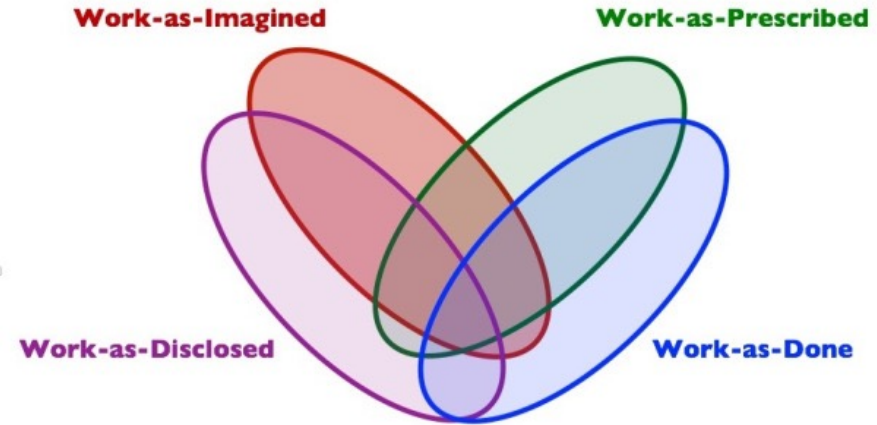
Selected barriers to effective implementation of SMS

- Disproportionate focus on accidents and incidents instead of the normal day to day performance
- Operators perceive their systems to be “perfect or resilient” with the humans being the source of deviations/ unwanted events/ poor performance
 - People create resilient and reliable systems because of their adaptability to dynamic work demands and emergent risks in the system
 - Design SMS with users in mind vs. retrospectively force-fitting them into sub-optimal systems
- Regulation strategy sets safety agenda and operator priorities
 - Compliance-based regulation necessary in industry with low risk maturity management
 - What agenda is the Regulator setting?



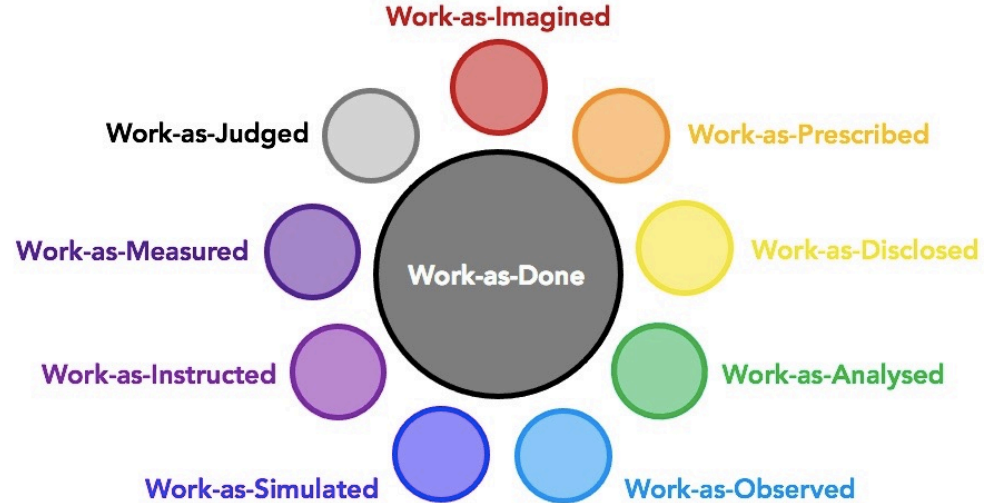
Creating better alignment between the SMS as prescribed vs SMS as implemented

- The SMS as imagined and prescribed should be grounded on the SMS as implemented → operator input and participation is critical
- Factors that distort the SMS as disclosed by operators need to be minimised in order to support the development of more effective regulatory framework. Requires consideration of the SMS as measured, analysed and judged



Creating better alignment between the SMS as prescribed vs SMS as implemented

- The SMS as imagined and prescribed should be grounded on the SMS as implemented → operator input and participation is critical
- Factors that distort the SMS as disclosed by operators need to be minimised in order to support the development of more effective regulatory framework. Requires consideration of the SMS as measured, analysed and judged
- Focus should be on understanding the effectiveness of the SMS as implemented in practice (i.e. work as done) through its proxies/archetypes



Thank You

Sma Ngcamu-Tukulula (CPE)
Human Factors/ Ergonomics Specialist



Email: info@smarte-ergonomics.co.za
Website: www.smarte-ergonomics.co.za