



IRSC 2022

INTERNATIONAL RAILWAY
SAFETY COUNCIL

SEVILLA, OCTOBER 16-21,
2022



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HUMAN FIRST

When Human Factors and Safety Walk Together



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Integrating Human Factors in Risk Analysis

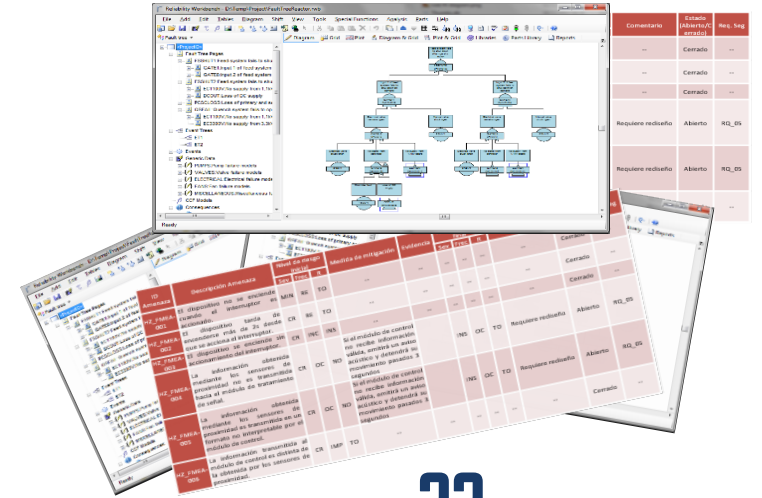
CHAPTER 3

Next steps: Process automation and the use of the data science

CHAPTER 1

Introduction

INTRODUCTION



INTRODUCTION

EUROPEAN STANDARD

EN 50126-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

October 2017

ICS 29.280; 45.020

Supersedes EN 50126-1:1999

English Version

Railway Applications - The Specification and Demonstration of Reliability, Availability, Maintainability and Safety (RAMS) - Part 1: Generic RAMS Process

Applications ferroviaires - Spécification et démonstration de la fiabilité, de la disponibilité, de la maintenabilité et de la sécurité (FDMS) - Partie 1: Processus FDMS générique

Bahnwendungen - Spezifikation und Nachweis von Zuverlässigkeit, Verfügbarkeit, Instandhaltbarkeit und Sicherheit (RAMS) - Teil 1: Generischer RAMS Prozess

This European Standard was approved by CENELEC on 2017-07-03. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

5.6.4 Human factors

Human factors are a core aspect within an integrated RAMS management process. An analysis of human factors, with respect to their effect on system RAMS, is inherent within the "systems approach" applied by this standard.

NOTE Guidance given by standards is rare but can be found in further European Standards, such as guidance on ergonomic design in EN 814.



European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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INTRODUCTION



INTRODUCTION

HUMAN First



INTRODUCTION

Railway Safety Area



Innovation Area



Aeronautical Safety Area



First benefits, before even starting!

- ✓ Finding a lot in common, knowledge and experience to share
- ✓ Transversal orientation of the project
- ✓ method valid for Railways and Aircraft operation, would be suitable for any other sector

INTRODUCTION

2016-2017

- ✓ Benchmarking of the Human Factors techniques
- ✓ Integration into risk analysis processes : practical and transversal
- ✓ First version of the Integration of the Human Factor into the Risk Assessments methodology



2018

- ✓ Improving methodology, changing the process, adapting and improving evaluation techniques
- ✓ University cooperation in the project



2019-2020

- ✓ Award for the best Ineco innovation project.
- ✓ CANSO Award
- ✓ Firts international Ineco's webinar



2021-2022

- ✓ Development of a tool for the application of the methodology.
- ✓ Human Performance Analysis using Data Science.
- ✓ Development of new products within the product line "Human First": InFact, BioMaF and GFA tool.



NEXT

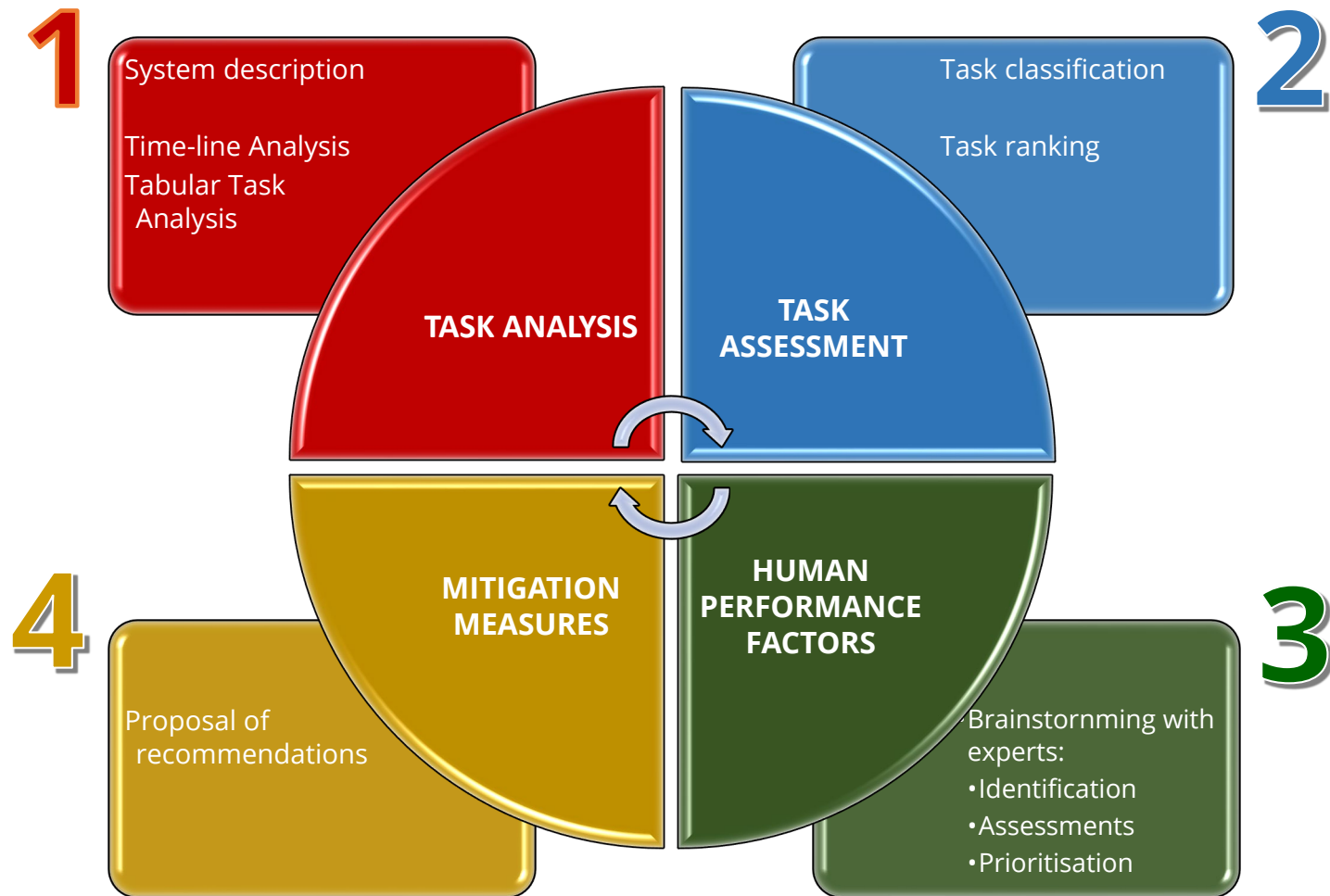
- ✓ Consolidation of the Human First line product.
- ✓ Research on new trends (resilience engineering, Safety II).



CHAPTER 2

Integrating Human Factors in Risk Analysis

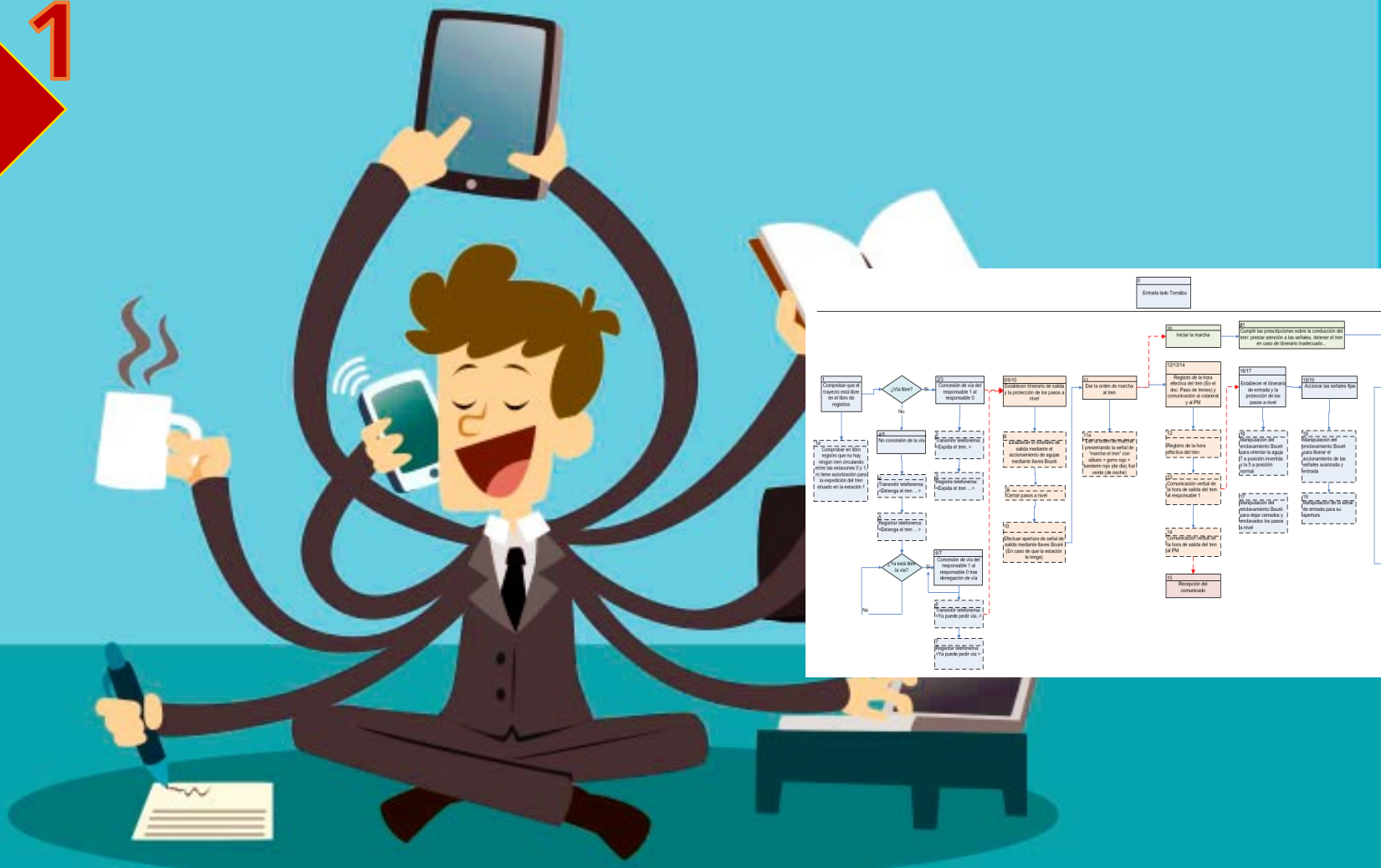
INTEGRATING HUMAN FACTORS IN RISK ANALYSIS



INTEGRATING HUMAN FACTORS IN RISK ANALYSIS

System Description

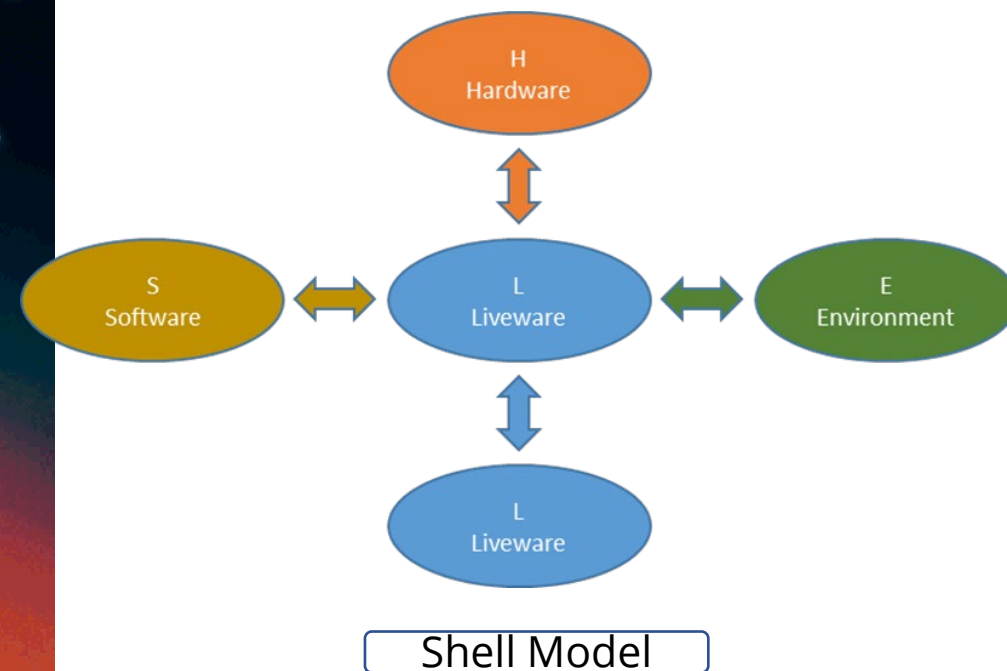
1



INTEGRATING HUMAN FACTORS IN RISK ANALYSIS

1

System Description



INTEGRATING HUMAN FACTORS IN RISK ANALYSIS

2

Task Assessment



INTEGRATING HUMAN FACTORS IN RISK ANALYSIS

3

Human Performance Factors



FATIGUE



TRAINING



HMI DESIGN



STRESS MANAGEMENT



WORK ENVIRONMENT



INTEGRATING HUMAN FACTORS IN RISK ANALYSIS

4

Mitigation Measures

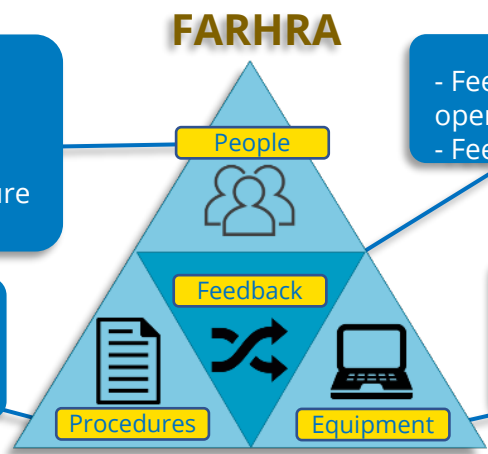


- People:**
- Competencies
 - Psychophysical condition
 - Organizational culture
 - Human team

- Procedures:**
- Procedures
 - Standards

- Feedback:**
- Feedback during operation
 - Feedback after operation

- Equipment:**
- Software
 - Hardware
 - Ergonomics



Feasible Action Rules for Human Reliability Assessment

INTEGRATING HUMAN FACTORS IN RISK ANALYSIS



- Systematic and practical methodology
- Work as done VS work as imagine
- Comprehensive and transversal
- Specific recommendations for the improvement of human performance

CANSO Award Winning Methodology

Ineco wins CANSO Global Safety Achievement Award 2019

<https://www.atc-network.com/atc-news/canso-and-ineco/ineco-wins-canso-global-safety-achievement-award-2019>

CHAPTER 3

Next steps: Process automation and the use of the data science

NEXT STEPS: PROCESS AUTOMATION AND THE USE OF THE DATA SCIENCE



Our iHISA tool...

ineco

Metodología para la integración del Factor Humano en los Análisis de Riesgos

Objetivo: La metodología desarrollada por Ineco busca solventar la necesidad de incluir el factor humano en los análisis de riesgos convencionales con el objetivo final de continuar mejorando la seguridad a través de la implantación y seguimiento de medidas de mitigación.

La información facilitada no se empleará para fines distintos de la mejora de la seguridad. La investigación del suceso analizado seguirá los principios de cultura justa, teniendo como objetivo la prevención de futuros incidentes y no la atribución de culpas o responsabilidades. La recopilación de datos para cada caso estudiado será anónima y desidentificada.

EXISTING SAFETY ASSESSMENT PROCESS HUMAN PERFORMANCE ASSESSMENT TO INTEGRATE

SYSTEM DESCRIPTION	TASK ANALYSIS	Hoja Actores_Roles_Tareas
HAZARDS IDENTIFICATION	HF ISSUES IDENTIFICATION	Hoja HZD_HPI_VCT_Ranking
HAZARDS RISK ASSESSMENT	TASK/ PERFORMANCE ASSESSMENT	Hoja HZD_HPI_VCT_Ranking
HZ CAUSES / EFFECTS ANALYSIS	H.P. AFFECTION (PSFs ID)	Hoja PSFs
RISK MITIGATION MEASURES → SRs	H.C. REDUCTION MEASURES → H.E.SRs	Hoja
SRs IMPLEMENTATION/FOLLOW-UP	H.C.SRs IMPLEMENTATION/FOLLOW-UP	Hoja

Herramientas y modelos utilizados

RESULTADOS

Etiquetas de fila

- Rebasar los piquetes o no dejarlos libres por cola
- EQ7
- ETS
- FP7

Total general

Descripción tarea

- Concesión de la vía
- Dar la orden de marcha
- Estacionar el tren
- Petición de vía
- Si detecta (itinerario in...)

Distribución del riesgo entre las 5 tareas más críticas

Nivel de riesgo SIN medidas de mitigación

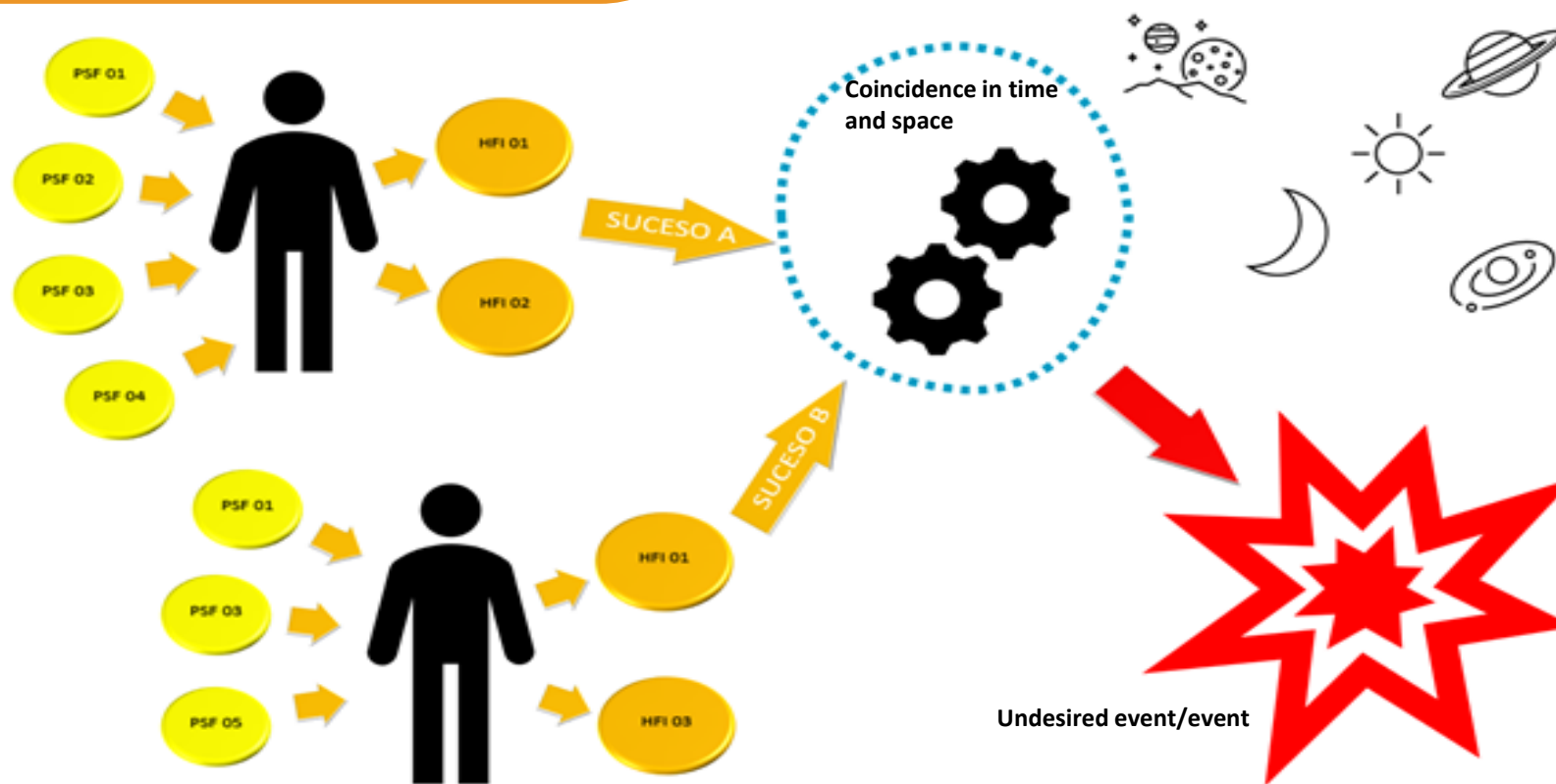
45

Nivel de riesgo CON medidas de mitigación

25

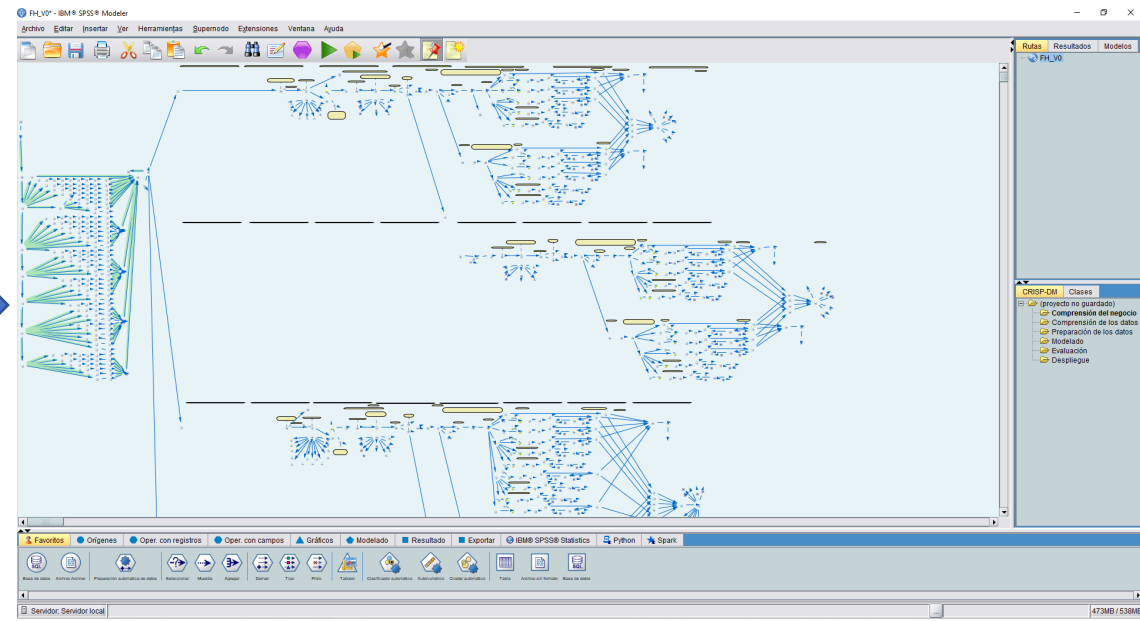
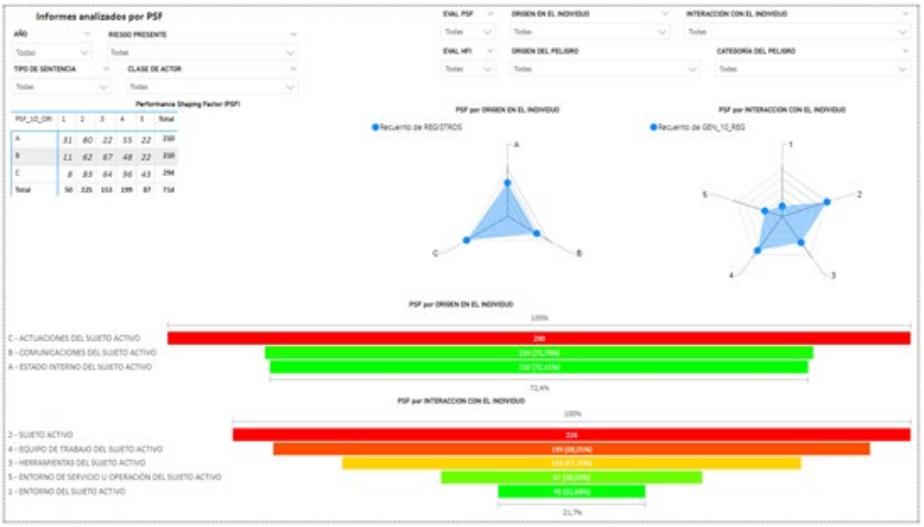
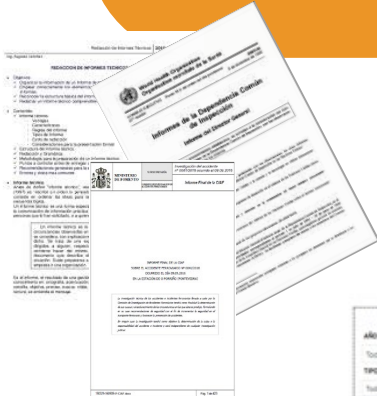
NEXT STEPS: PROCESS AUTOMATION AND THE USE OF THE DATA SCIENCE

The InFact tool and data base



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The InFact tool and data base

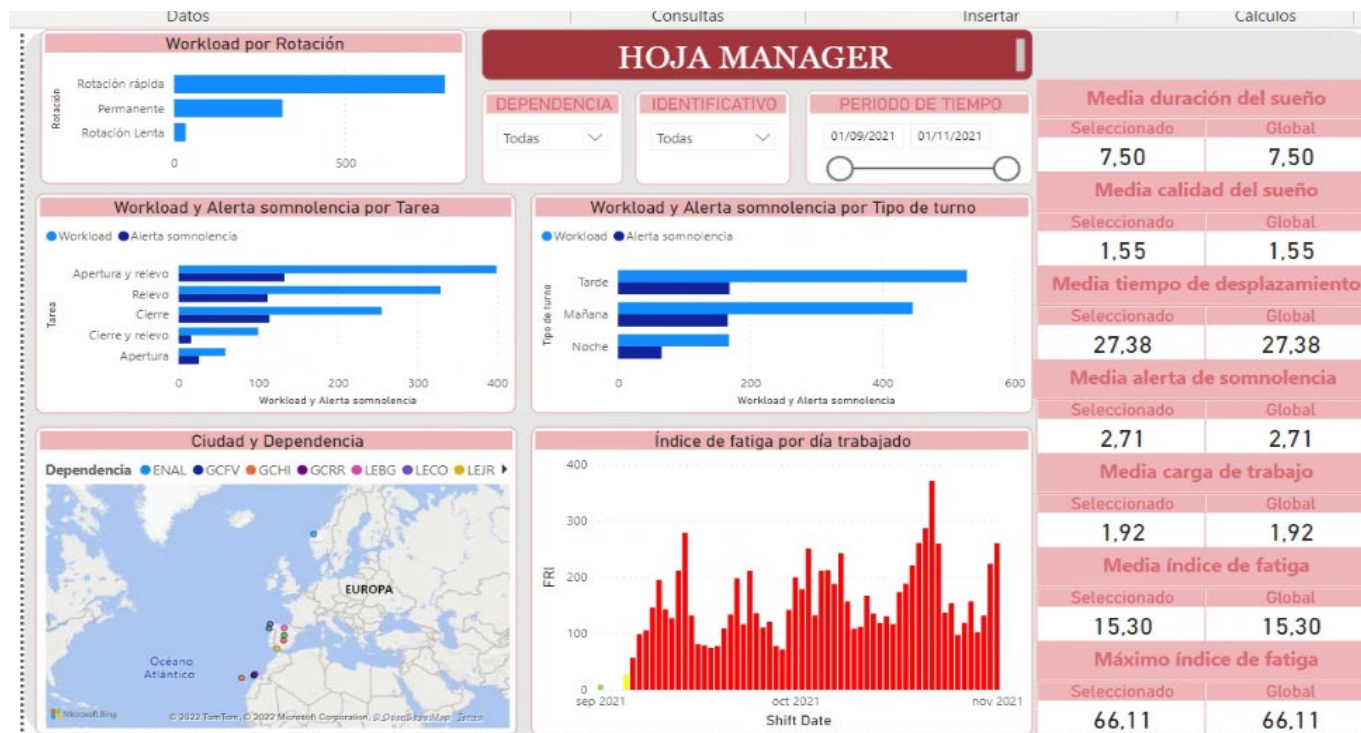


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NEXT STEPS: PROCESS AUTOMATION AND THE USE OF THE DATA SCIENCE

The BioMaF model



Media duración del sueño	
Seleccionado	Global
7,50	7,50
Media calidad del sueño	
Seleccionado	Global
1,55	1,55
Media tiempo de desplazamiento	
Seleccionado	Global
27,38	27,38
Media alerta de somnolencia	
Seleccionado	Global
2,71	2,71
Media carga de trabajo	
Seleccionado	Global
1,92	1,92
Media índice de fatiga	
Seleccionado	Global
15,30	15,30
Máximo índice de fatiga	
Seleccionado	Global
66,11	66,11

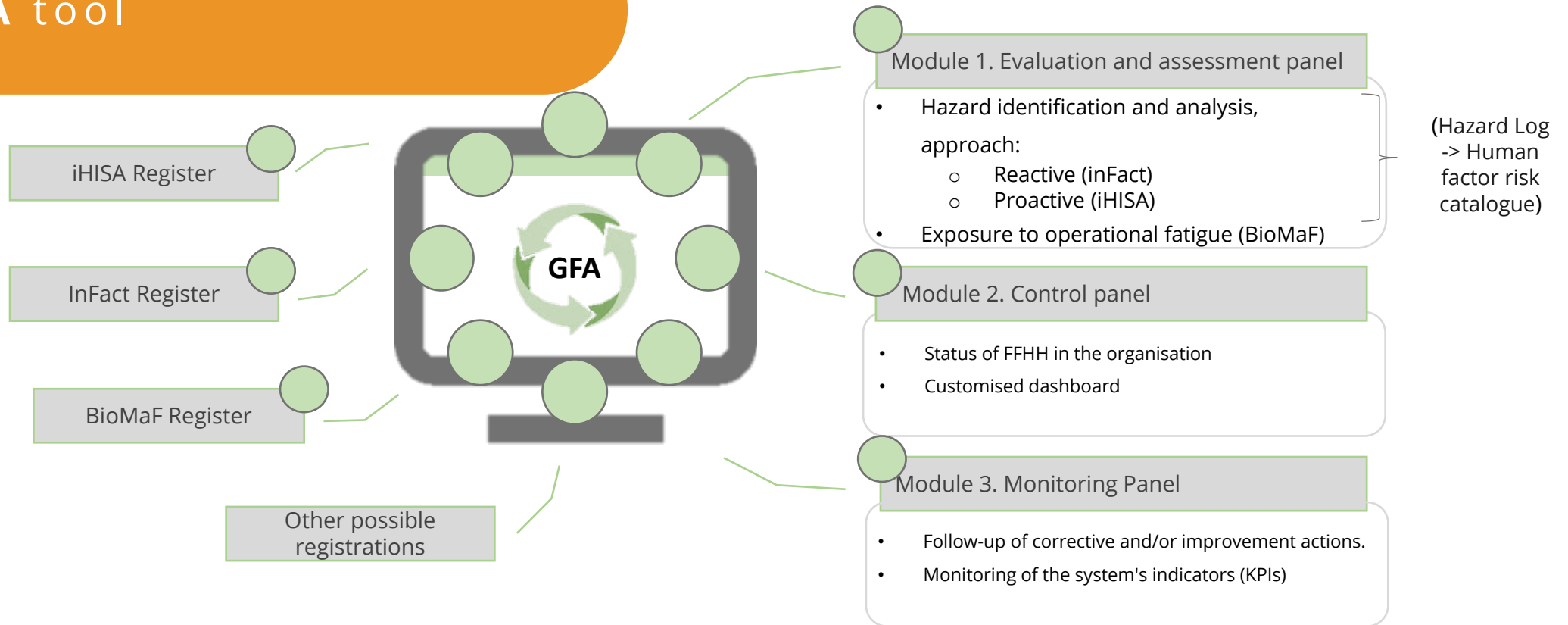
Seleccione un identificador			Número de trabajadores	
1000			26	
Horas trabajadas	Horas trabajadas	Horas trabajadas	Total horas trabajadas	
#	#	#	#	
182	10,20	27,20	228,70	
79,76	4,46	11,89	100	

Seleccione un identificador			Número de trabajadores	
Todos			26	
Horas trabajadas	Horas trabajadas	Horas trabajadas	Total horas trabajadas	
#	#	#	#	
3110	301,10	156,70	3,62 mil	
85,91	8,32	4,33	100	



NEXT STEPS: PROCESS AUTOMATION AND THE USE OF THE DATA SCIENCE

The GFA tool





COMPANY
LOGO

www.irsc2022.com

