Desarrollo y validación de un método basado en KPIs y de una herramienta de software para la medicion focalizada de la resiliencia del desempeño del sistema de gestión de la SST

Jesús M. López de Ipiña JM
Industry and Transport Division
Project Manager

tecnalia Inspiring Business

CIOP PIB Centralny Instytut Ochrony Pracy Państwowy Instytut Badawczy

tecnalia Inspiring Business

Finnish Institute of Occupational Health

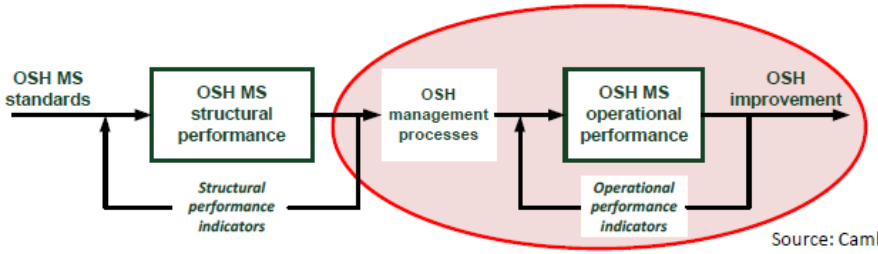
OSALAN

Barakaldo - OSALAN, 29-04-2016

La participación de TECNALIA en este proyecto ha sido posible gracias a la financiación de OSALAN

Objetivos

- Desarrollar un conjunto relativamente pequeño de **indicadores clave de rendimiento – KPIs** (aproximadamente 20-30) asignados a los componentes individuales del sistema de gestión de la SST
- **Desarrollar y validar** en entornos industriales una **herramienta de software autónoma, amigable y personalizable** por las empresas para facilitar la implantación y seguimiento de los KPIs
- **Difundir los resultados del proyecto**



Source: Cambon et al. (2005)

CIOP PIB
Centralny Instytut Ochrony Pracy
Państwowy Instytut Badawczy

tecnalia Inspiring Business

La participación de Tecnalia en este proyecto ha sido posible gracias a la financiación de OSALAN

OSALAN

Finnish Institute of Occupational Health

Consorcio

Partner organization	Country	Project teams	Funding requested from
CIOP PIB Central Institute for Labour Protection - National Research Institute	Poland	Daniel Podgórski, Anna Skład, Katarzyna Buszkiewicz-Seferyńska, Zofia Pawłowska, Małgorzata Pęciłło	Central Institute for Labour Protection - National Research Institute
Finnish Institute of Occupational Health FIOH	Finland	Jarmo Vorme, Riikka Ruotsala	Finnish Institute of Occupational Health (FIOH) Ministry of Social Affairs and Health (MSAH), Finland
tecnalia Research & Innovation	Spain	Jesús Lopez De Ipiña Peña, Julien Negre	Instituto Vasco de Seguridad y Salud Laborales (OSALAN), Spain

Scientific Advisory Panel

Prof. Eric HOLLNAGEL	Denmark	University of Southern Denmark
Prof. Gerard ZWETSLOOT	The Netherlands	TNO - The Netherlands Foundation for Applied Scientific Research
Dr. Markku AALTONEN	Finland	Finnish Institute of Occuppational Health
Mario CALDERÓN	Spain	AENOR - The Spanish Association for Standardisation and Certification

La participación de Tecnalia en este proyecto ha sido posible gracias a la financiación de OSALAN

Metodología

An overview of the project methodology

Building an initial set of candidate PPIs for measuring OSH MS operational status

↓

Selecting KPIs assigned to individual OSH MS components of (with the AHP method)

↓

Developing a software tool supporting KPI-based measurement of OSH MS

↓

Pilot testing in several enterprises and validation of the KPIs and a software tool

↓

Adapting the tool to users' needs and dissemination of project results

CIOP PIB
Centralny Instytut Ochrony Pracy
Państwowy Instytut Badawczy

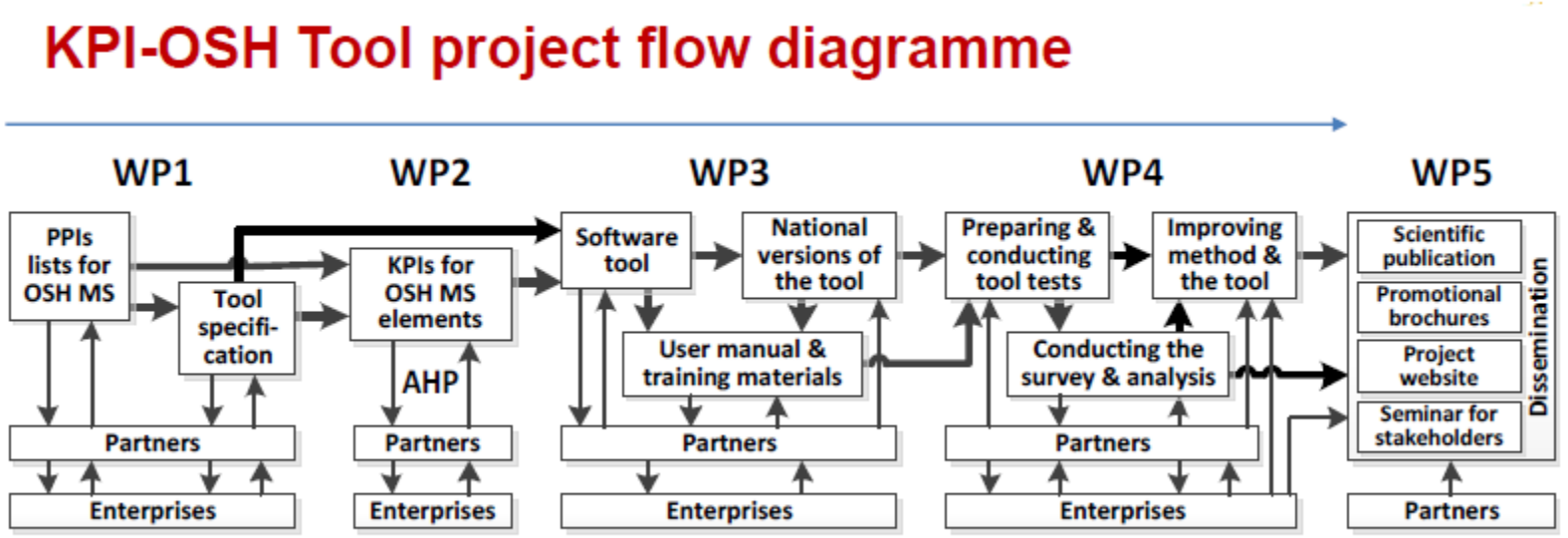
tecnalia Inspiring Business

La participación de Tecnalia en este proyecto ha sido posible gracias a la financiación de OSALAN

OSALAN

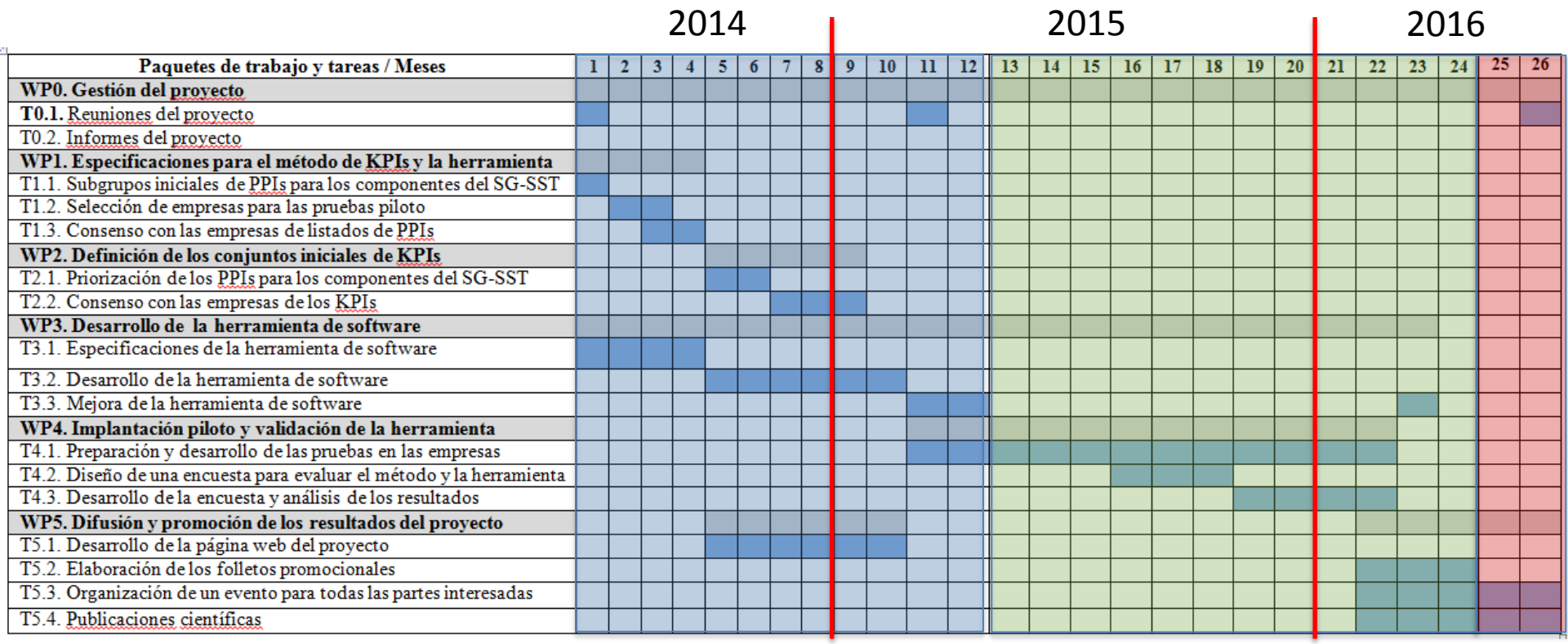
Finnish Institute of Occupational Health

Paquetes de trabajo (WPs)



La participación de Tecnalia en este proyecto ha sido posible gracias a la financiación de OSALAN

Plan



Mayo 2014 a Junio 2016 (26 meses)

CIOP PIB
Centralny Instytut Ochrony Pracy
Państwowy Instytut Badawczy

tecnalia Inspiring Business

La participación de Tecnalia en este proyecto ha sido posible gracias a la financiación de OSALAN

OSALAN

Finnish Institute of Occupational Health

Presupuesto

Socio	Financiación solicitada (€)	Contribución propia (€)	Otra financiación (€)	Costes totales (€)
Socio 1: CIOP-PIB (Coordinador)				
2014	45.474			45.474
2015	38.357			38.357
2016	32.562			32.562
Subtotal	116.393			116.393
Socio 2: FIOH				
2014	20.635		14.468	35.103
2015	4.438		20.938	25.376
2016	16.724		19.938	36.662
Subtotal	41,797		55.344	97.141
Socio 3: TECNALIA*				
2014	50.000	15.700		65.700
Total:	208.190	15.700	55.344	**279.234**

Financiación OSALAN

OSALAN
Laneko Segurtasun eta Osasunerako Euskal Erakundea
Instituto Vasco de Seguridad y Salud Laborales

CIOP PIB
Centralny Instytut Ochrony Pracy
Państwowy Instytut Badawczy

tecnalia Inspiring Business

La participación de Tecnalia en este proyecto ha sido posible gracias a la financiación de OSALAN

Finnish Institute of Occupational Health

Entregables

- D1. **Lista inicial de KPIs** dividida en subgrupos asignados a los componentes individuales del SG-SST;
- D2. **Herramienta de software** (en cuatro lenguas de la UE), acompañada de un manual de usuario y **materiales de formación**, para apoyar a las empresas en la recopilación de datos y la medición del desempeño del SG-SST en base a KPIs;
- D3. **Folletos** para difundir los resultados del proyecto y promover el concepto de mejora del SG-SST en base a KPIs ;
- D4. **Artículos científicos** sobre la metodología y los resultados del proyecto publicados en revistas internacionales.

CIOP PIB
Centralny Instytut Ochrony Pracy
Państwowy Instytut Badawczy

tecnalia Inspiring Business

La participación de Tecnalia en este proyecto ha sido posible gracias a la financiación de OSALAN

OSALAN

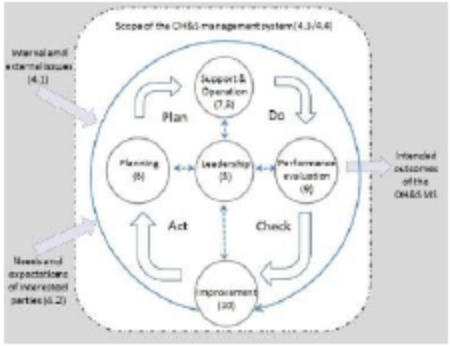
Finnish Institute of Occupational Health

Proceso general de KPIs

General overview of the process of building a set of KPIs

373 PPIs derived from literature sources

Assigning to OSH components (ISO CD 45001 model)



Structured raw set of PPIs

Grouping and removing redundant PPIs

Refined set of PPIs

120 en 23 subconjuntos

Cleaning the PPI sets by eliminating indicators which are non-realistic, too complex, over-fancied (Partners and enterprises)

65 en 20 subconjuntos

Sets of PPIs ready for KPI selection

KPI SELECTION CRITERIA

- Relevante (40 %)
- Comprensible (15 %)
- Rentable (15 %)
- Medible (15 %)
- Objetivo (15 %)

AHP MakelRational tool

KPIs prioritized, & selected

CIOP PIB
Centralny Instytut Ochrony Pracy
Państwowy Instytut Badawczy

tecnalia Inspiring Business

La participación de Tecnalia en este proyecto ha sido posible gracias a la financiación de OSALAN

Finnish Institute of Occupational Health

KPIs iniciales y eliminación de redundantes

Elimination of redundant indicators (grouping of PPIs)

Comp. no.	PPIs derived from the literature	PPIs grouped with regard to their similar definition, structure and meaning, and being based on the same input data	Indicator representing PPIs of a given group
Leadership			
5.1. Leadership and commitment			
A.	- Workers' rating of supervisors/project management's commitment to OHS (6.18) - Percent of jobsite toolbox meetings attended by jobsite supervisors/managers (8.6) - Percent of jobsite pre-task planning meetings attended by jobsite supervisors/managers (8.7) - Frequency and quality of OHS reporting by or to senior management (10.2) - Employee perception of management commitment (10.26) - Perceptions of management commitment to safety (12.13) - Staff perceptions of management commitment to health (12.50) - Management commitment to OHS (staff perception) (14.27) - % of safety leadership acts carried out against target (14.47) - % managers attended OHS leadership training (15.2) - % managers participation in audits (15.3) - % of OHS training that is opened by a senior manager (15.4) - % of safety meetings attended by senior managers (15.5) - % of workers rating manager commitment to OHS as high or % of high ratings from overall findings (15.50) - % of safety meetings attended by senior managers (15.179) - % of managers participating in incident investigation (15.331) - % of managers leading an incident investigation (15.332) - % of audit results reviewed by senior management (15.346)	- Workers' rating of supervisors/project management's commitment to OHS - Employee perception of management commitment - Perceptions of management commitment to safety - Staff perceptions of management commitment to health - Management commitment to OHS (staff perception) - % of workers rating manager commitment to OHS as high or % of high ratings from overall findings	A1. Employee perception of management leadership and commitment to OSH (rating resulting from the survey)
		- Percent of jobsite toolbox meetings attended by jobsite supervisors/managers - Percent of jobsite pre-task planning meetings attended by jobsite supervisors/managers - % of safety meetings attended by senior managers	A2. % of safety meetings attended by senior managers
		- % of safety leadership acts carried out against target	A3. % of safety leadership acts carried out against target
		- % managers attended OHS leadership training	A4. % managers attended OSH leadership training
		- % managers participation in audits - % of audit results reviewed by senior management	A5. % of audit results reviewed by senior managers
		- % of OHS training that is opened by a senior manager	A6. % of OSH training that is opened by a senior manager
		- % of managers participating in incident investigation - % of managers leading an incident investigation	A7. % of managers participating in or leading incident investigation

Results: 120 PPIs in 23 subsets assigned to individual OSH MS components

CIOP PIB
Centralny Instytut Ochrony Pracy
Państwowy Instytut Badawczy

tecnalia Inspiring Business

La participación de Tecnalia en este proyecto ha sido posible gracias a la financiación de OSALAN

OSALAN

Finnish Institute of Occupational Health

KPIs consultados a las empresas

Table for consulting PPIs with safety managers in enterprises

PPI No.	PPIs proposed for a given OSH MS component	Is this indicator already in use? If not, do you collect the data to calculate the of the indicator?	Will the indicator provide an added value to your OSH MS and be useful for the company?	Would you change your indicator into this new one?	How would you like to change (reformulate) this new indicator?	A timeframe in which the process being monitored may noticeably change	Frequency of measurements (weekly, monthly, quarterly etc.)
A.	LEADERSHIP AND COMMITMENT						
A1.	Employee perception of management leadership and commitment to OSH (rating resulting from the survey)						
A2.	% of safety meetings attended by senior managers						
A3.	% of safety-focused actions with demonstrated leadership carried out by managers against target						
A4.	% managers attended OSH leadership training						
A5.	% of audit results reviewed by senior managers						
A6.	% of OSH training that is opened by a senior manager						
A7.	% of managers participating in or leading incident investigation						
	Suggestions for other PPIs for component A:						

Results of consultations: 65 PPIs divided into 20 subsets

CIOP PIB
Centralny Instytut Ochrony Pracy
Państwowy Instytut Badawczy

tecnalia Inspiring Business

La participación de Tecnalia en este proyecto ha sido posible gracias a la financiación de OSALAN

OSALAN
Laneko Segurtasun eta Osasunerako Euskal Erakundea
Instituto Vasco de Seguridad y Salud Laborales

Finnish Institute of Occupational Health

Criterios científicos de selección

Criteria for the selection of performance indicators

Examples found in the literature:

- **Wreathall J., 2001.** ***Final Report on Leading Indicators of Human Performance,*** **EPRI, Palo Alto, CA, and the U.S. Department of Energy, Washington, DC, USA.**
- **Kjellen U., 2009.** ***The safety measurement problem revisited.*** **Safety Science, 47 (4), 486-489**
- **Hale A., 2009.** ***Why safety performance indicators?*** **Safety Science, 47 (4), 479-480**
- **Hollnagel E., 2013.** ***The Resilience Analysis Grid (RAG)***
- **Step Change in Safety, 2003.** ***Leading Performance Indicators. Guidance for for Effective Use.***
- **SMART (Specific, Measurable, Achievable, Relevant, Time-bound)**

La participación de Tecnalia en este proyecto ha sido posible gracias a la financiación de OSALAN

Criterios propuestos por el proyecto

Criteria proposed for KPI-OSH Tool project

Comprehended	• Clearly defined to be easily understood and communicated by/to all persons participating in and/or supervising the process (communication power)
Objective	• Based on objective sources of data • It is impossible to manipulate its value without introducing real changes to OSH management processes
Relevant	• Representative for monitoring operational performance of a given OSH MS component • Providing information relevant for corrective/preventive action (potential for the improvement)
Measurable	• Data easy to be collected, measured and calculated • Sensitive to small changes of the working environment • Capable to measure process dynamics
Cost efficient	• Arrangements and resources necessary for the measurement are available • Benefits for OSH exceed the costs of measurements

CIOP PIB
Centralny Instytut Ochrony Pracy
Państwowy Instytut Badawczy

tecnalia Inspiring Business

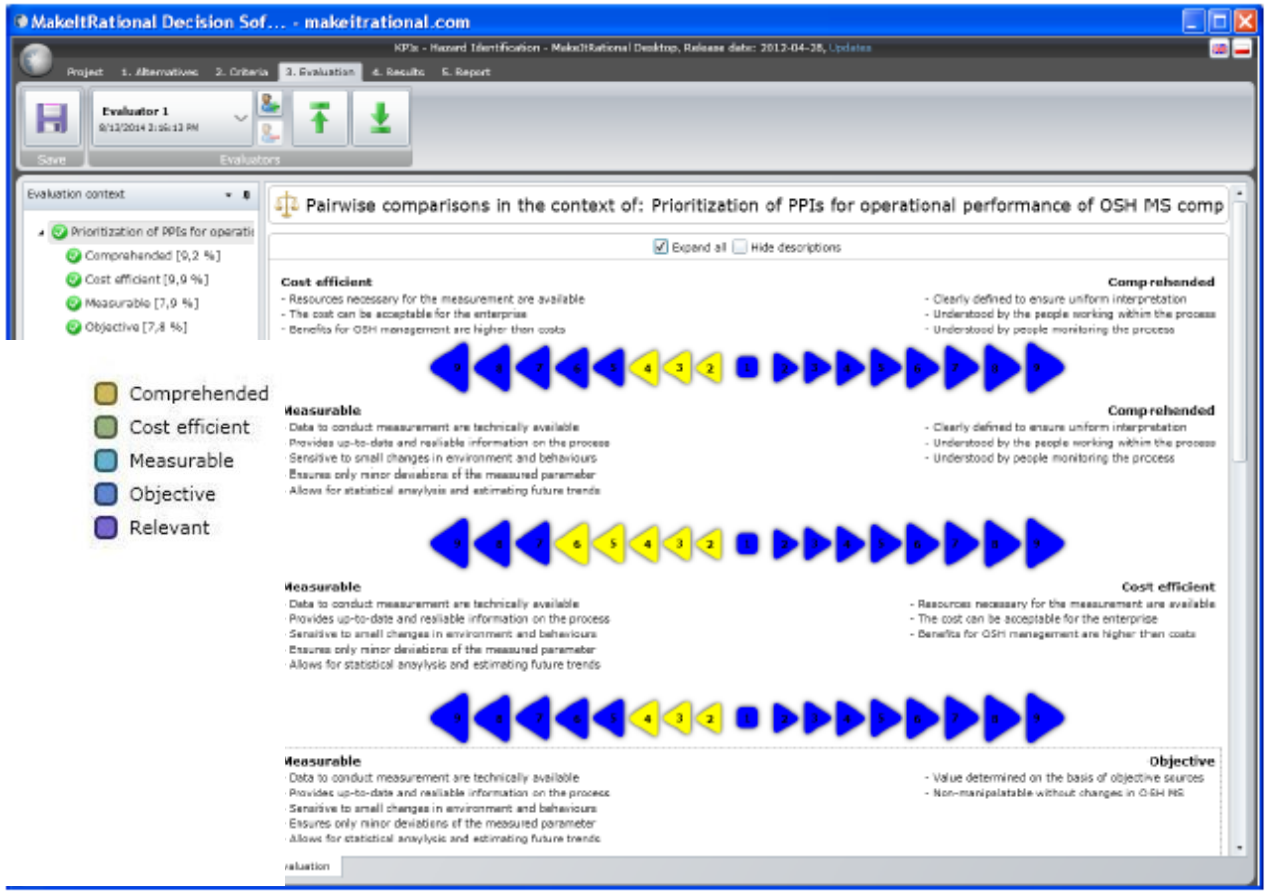
La participación de Tecnalia en este proyecto ha sido posible gracias a la financiación de OSALAN

OSALAN

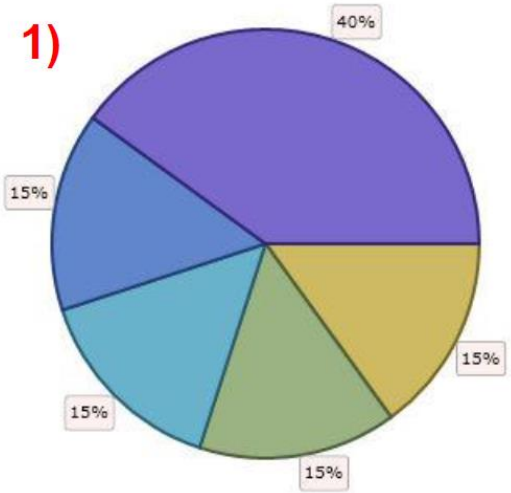
Finnish Institute of Occupational Health

Comparación y selección de los KPIs

Ranking criteria by pairwise comparisons



1)



AHP comparisons supported by MakeItRational tool (makeitrational.com)

CIOP PIB
Centralny Instytut Ochrony Pracy
Państwowy Instytut Badawczy

tecnalia Inspiring Business

La participación de Tecnalia en este proyecto ha sido posible gracias a la financiación de OSALAN

OSALAN

Finnish Institute of Occupational Health

Lista final de KPIs (20 + 7)

OSH MS area		No.	Acronym		KPI definition	OSH MS component	Meas. frequency
Leadership		1.	AR	AudRevd	Percentage of internal audit reports reviewed by senior managers (against the number of audits conducted in a given reporting period)	*Leadership and commitment*	Yearly
		2	LP1	LeadPerc(1) (alternative)	Workers' perception of management leadership and commitment to OSH (rating resulting from a survey)	*Leadership and commitment*	Yearly
		3.	LP2	LeadPerc(2) (alternative)	Percentage of workers positively evaluating management leadership and commitment to OSH (against total number of workers, rating resulting from a survey)		
		4.	JA	JobsAssd	Percentage of job descriptions reviewed and updated in a given reporting period for their compliance with OSH management system requirements (against the total number of jobs planned to be reviewed)	*Organizational roles, responsibilities, accountabilities and authorities*	Quarterly
Planning	Risk management	5.	HC	HazCntrl	Percentage of hazards with control measures applied (against the total number of new hazards identified in a given reporting period)	*Hazard identification*	Quarterly
		6.	HR	HazRevd (alternative)	Percentage of hazard investigations reviewed according to schedule in a given reporting period (against the total number of identified hazards)		Quarterly
		7.	RA	RiskAssd	Percentage of OSH risk assessments completed or reviewed in a given reporting period (against the total number of OSH risk assessments planned)	*Assessment of OSH risks*	Quarterly
		8.	RC	RiskCntrl	Percentage of OSH risk control measures successfully completed in a given reporting period (against the total number of risk control measures planned for implementation)	*Planning to take action*	Monthly or weekly
	OSH plans	9.	OA	ObjAchvd	Percentage of OSH objectives achieved according to the plans in a given reporting period (against the total number of OSH objectives)	*Planning to achieve OSH objectives*	Yearly

CIOP PIB
Centralny Instytut Ochrony Pracy
Państwowy Instytut Badawczy

tecnalia Inspiring Business

La participación de Tecnalia en este proyecto ha sido posible gracias a la financiación de OSALAN

OSALAN

Finnish Institute of Occupational Health

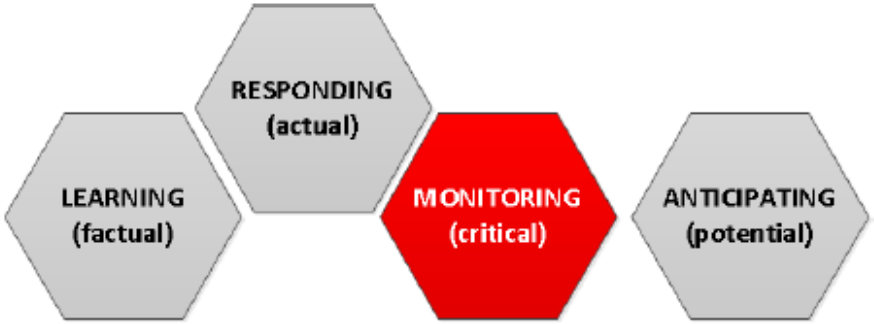
Resiliencia

KPIs from the resilience perspective

- **How can the use of KPIs contribute to four basic capabilities of the resilient organisation?**

- **Resilience:** ***The intrinsic ability of a system to adjust its functioning prior to, during, or following changes and disturbances, so that it can sustain required operations under both expected and unexpected conditions***

- **Selected KPIs should contribute to all four basic abilities of the resilient system**



Source: Hollnagel (2013)

CIOP PIB
Centralny Instytut Ochrony Pracy
Państwowy Instytut Badawczy

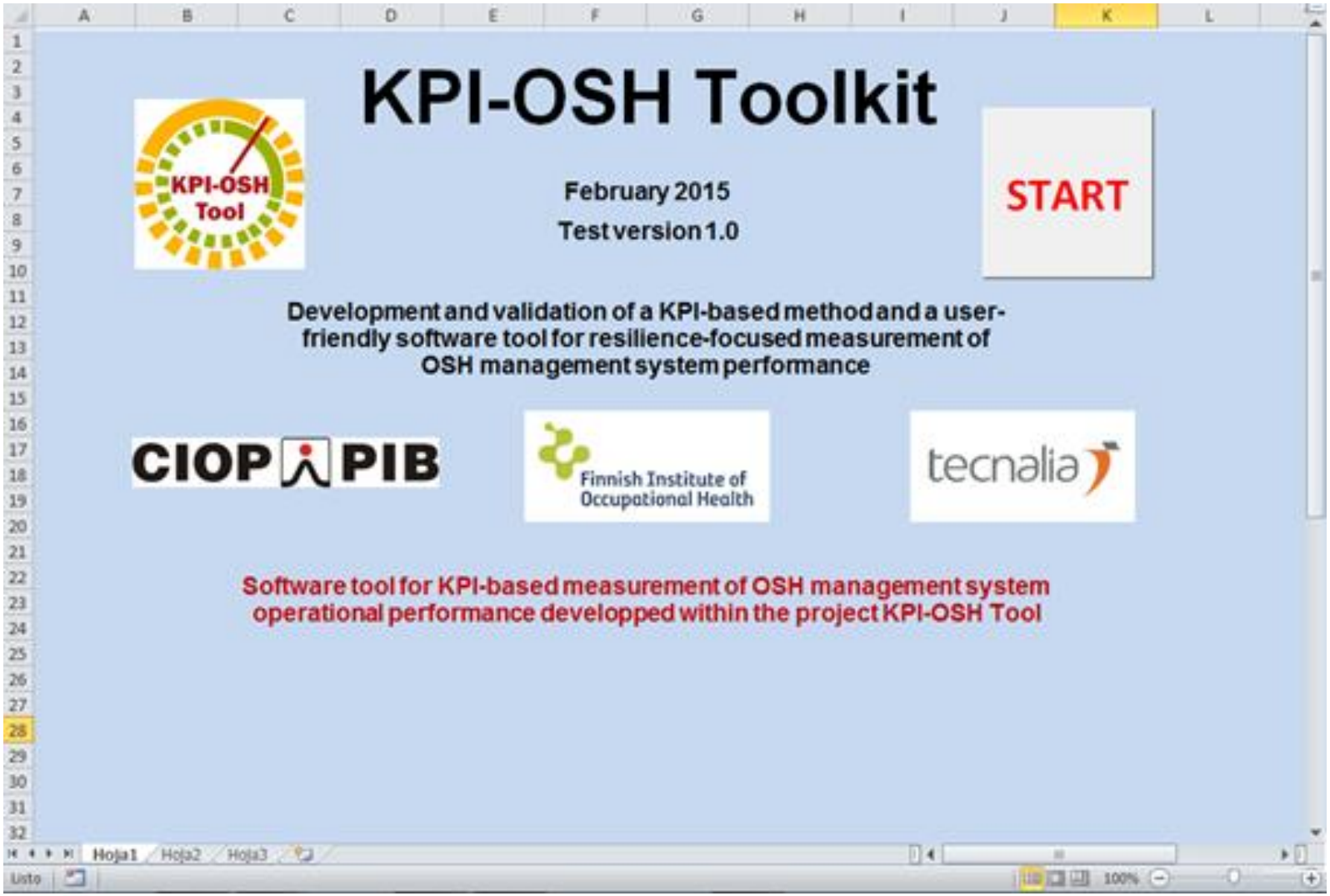
tecnalia Inspiring Business

La participación de Tecnalia en este proyecto ha sido posible gracias a la financiación de OSALAN

OSALAN

Finnish Institute of Occupational Health

KPI-OSH Toolkit (1)



CIOP PIB
Centralny Instytut Ochrony Pracy
Państwowy Instytut Badawczy

tecnalia Inspiring Business

La participación de Tecnalia en este proyecto ha sido posible gracias a la financiación de OSALAN

OSALAN

Finnish Institute of Occupational Health

KPI-OSH Toolkit (2)

- **Software independiente** basado en aplicaciones de **MS Excel y Word**
- Para apoyar la **implantación y seguimiento** de indicadores clave de rendimiento en las empresas (**KPIs**)
- Proporcionando a los gestores una **imagen precisa del desempeño del SG-SST**
- Principales características y funcionalidades:
  - ✓ Fácilmente **personalizable y fácil de u**sar
  - ✓ Selección de los **KPIs preferidos** (de 27 predefinido KPIs)
  - ✓ **Personalización de KPIs** a las condiciones específicas de cada empresa
  - ✓ Creación y uso de indicadores **adicionales KPI** (si es necesario)
  - ✓ **Cálculo de KPIs** para los periodos seleccionados (informes)
  - ✓ **Visualización de diagramas KP**I personalizados por los usuarios
  - ✓ Generación de **informes en formatos MS Word y Excel**

CIOP PIB
Centralny Instytut Ochrony Pracy
Państwowy Instytut Badawczy

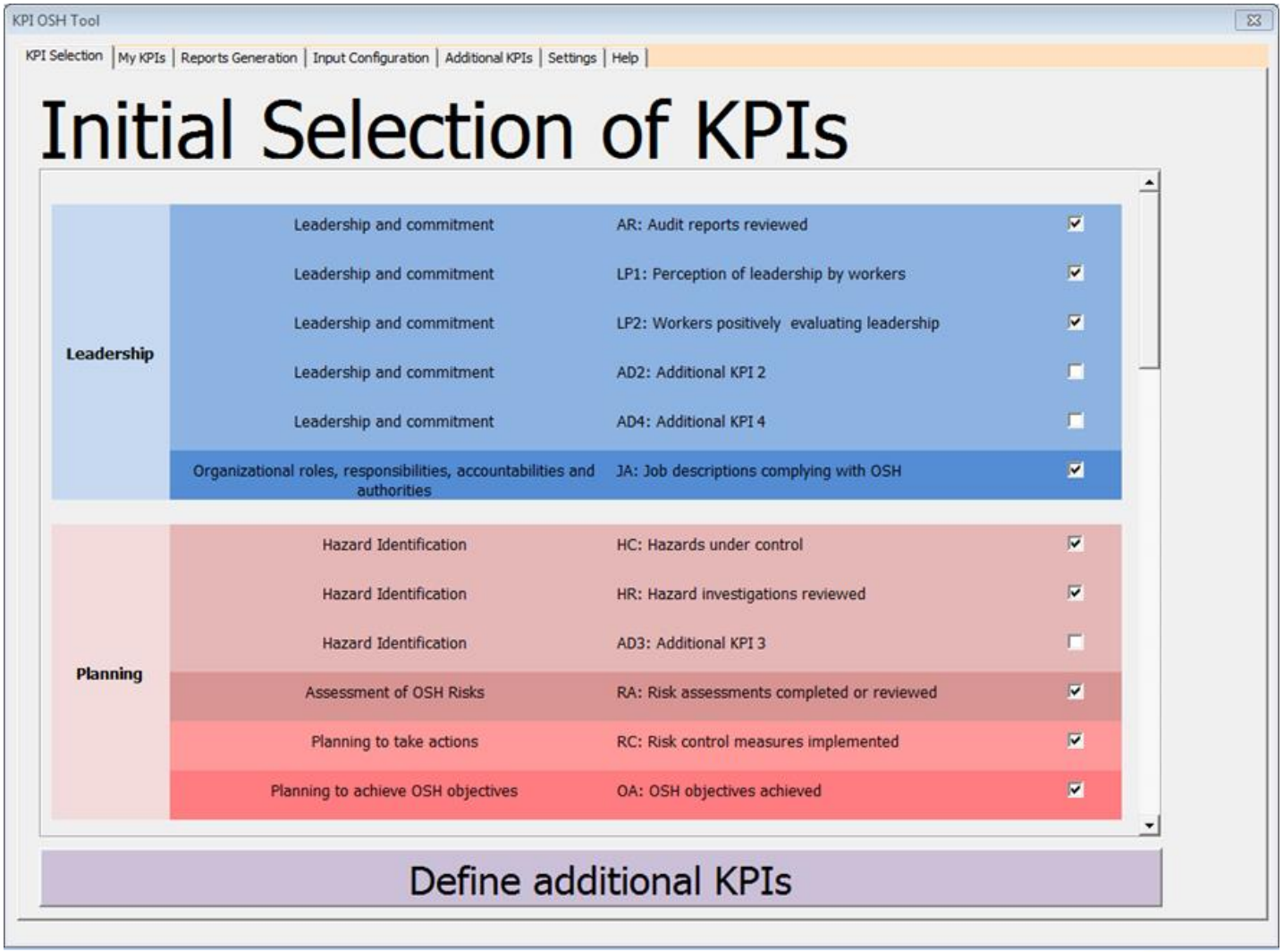
tecnalia Inspiring Business

La participación de Tecnalia en este proyecto ha sido posible gracias a la financiación de OSALAN

OSALAN

Finnish Institute of Occupational Health

KPI-OSH Toolkit (3)



CIOP PIB
Centralny Instytut Ochrony Pracy
Państwowy Instytut Badawczy

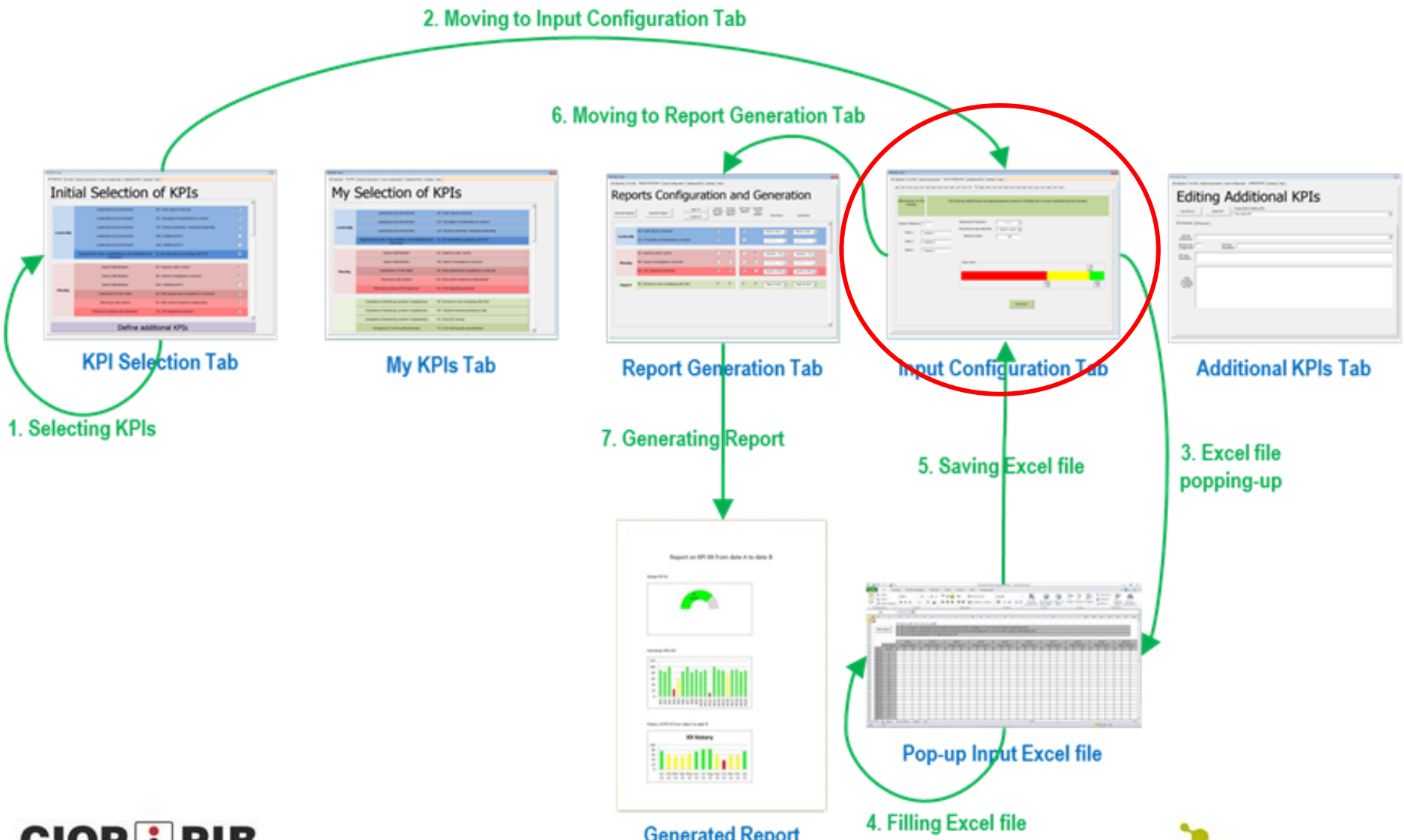
tecnalia Inspiring Business

La participación de Tecnalia en este proyecto ha sido posible gracias a la financiación de OSALAN

OSALAN

Finnish Institute of Occupational Health

KPI-OSH Toolkit (4)



CIOP PIB
Centralny Instytut Ochrony Pracy
Państwowy Instytut Badawczy

tecnalia Inspiring Business

La participación de Tecnalia en este proyecto ha sido posible gracias a la financiación de OSALAN

OSALAN

Finnish Institute of Occupational Health

KPI-OSH Toolkit (5)

5. HC HazCntrl [1] Acronym:	[2] KPI name: **Percentage of hazards with control measures applied (against the total number of new hazards identified in a given reporting period)**

[3] OSH MS component: **6.1.2. Hazard Identification**

[4] Data necessary to calculate the KPI:

X_i - No. of newly identified hazards[1] in *i*-th unit, in respect to which appropriate control measures have been implemented according to schedule[2] within a given reporting period;

Y_i - Total no. of newly identified hazards in *i*-th unit, in respect to which appropriate control measures should have been implemented within a given reporting period;

N - no. of units conducting hazard identification and collecting data on newly identified hazards.

[5] Calculation formula:

$$HC_i = X_i / Y_i \cdot 100\%$$

$$HC = \frac{\sum_{i=1}^{N} X_i}{\sum_{i=1}^{N} Y_i} \cdot 100\%$$

1) Hazards identified at new workstations, in new processes/machines, or hazards identified as new ones at existing workstations/processes.

2) The length of the period required for planning and the implementation of control measures after identification of a hazard can be specified (e.g. no. of days) or unlimited.

[6] **Source of data:** Internal reports or records resulting from risk assessment/management processes, which include the identification of hazards in individual units of the enterprise (maintained by heads of the units and/or by the safety manager/OSH department).

[7] Measurement frequency:	[8] **Graphical representation:**	[9] **Colour policy:**
Quarterly	HC current value: semicircular speedometer (with colour policy) HC_i current values: vertical bars (one for each unit[3], but ≤ 10) HC historical values: vertical bars for X past reporting periods[3] 3) No. of bars for units & periods should be set up by the user (no. ≤ 10).	Red: HC < 70% Yellow: 70% ≤ HC ≤ 90% Green: HC > 90%

- Acrónimo
- Nombre
- Componente del SG-SST
- Datos necesarios para su cálculo
- Fórmula de cálculo
- Descripción dela fuente de datos
- Frecuencia de medición
- Representación gráfica
- Política de colores

CIOP PIB
Centralny Instytut Ochrony Pracy
Państwowy Instytut Badawczy

tecnalia Inspiring Business

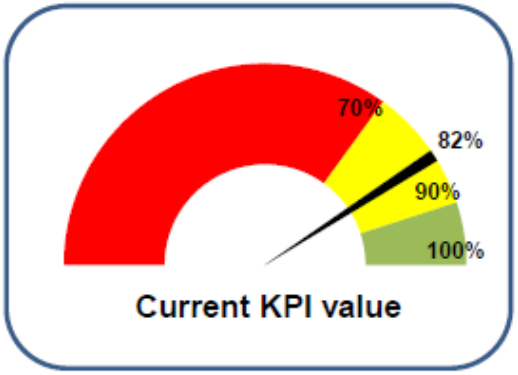
La participación de Tecnalia en este proyecto ha sido posible gracias a la financiación de OSALAN

OSALAN

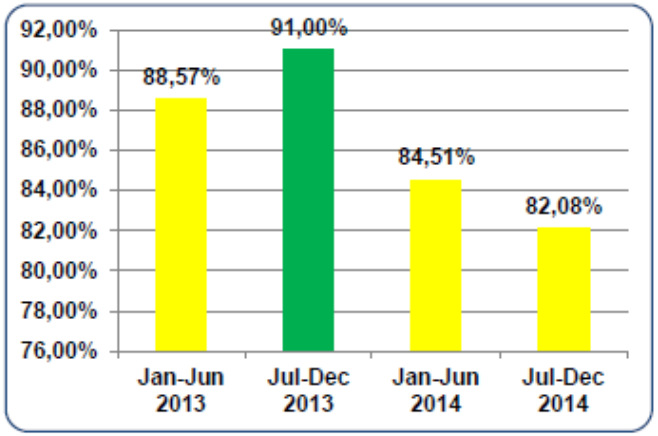
Finnish Institute of Occupational Health

KPI-OSH Toolkit (7)

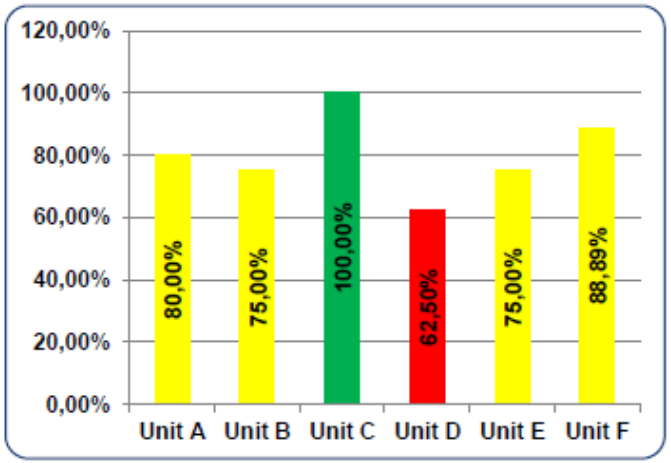
Example KPI diagrams



Current KPI value



KPI values in selected reporting periods



Values of sub-KPIs for individual units

CIOP PIB
Centralny Instytut Ochrony Pracy
Państwowy Instytut Badawczy

tecnalia Inspiring Business

La participación de Tecnalia en este proyecto ha sido posible gracias a la financiación de OSALAN

OSALAN

Finnish Institute of Occupational Health

Project website

http://www.oshkpitool.eu/

Project information | Workpackages | Consortium | Resources | Contact | Useful links

KPI-OSH Tool

KPI-OSH-Tool: Developme
resilience-f

This is the official website of the
the SAF€RA 2013 joint call. The

SAF€RA Work programr
topics addressed:

Project information | Workpackages | Consortium | Resources | Contact | Useful links

- Abstract and slides on the KPI-OSH Tool project presented at the 3rd SAF€RA Symposium on Future Research Programming on Industrial Safety, Paris, 9-10 February 2015
- Leaflet on KPI-OSH Tool project: An innovative method for the measurement of operational performance of occupational safety and health management systems
- List of Key Performance Indicators proposed for the measurement of operational performance of OSH management systems

KPI OSH Tool Website - 2014

CIOP PIB
Centralny Instytut Ochrony Pracy
Państwowy Instytut Badawczy

tecnalia Inspiring Business

La participación de Tecnalia en este proyecto ha sido posible gracias a la financiación de OSALAN

OSALAN

Finnish Institute of Occupational Health

www.tecnalia.com

Muchas gracias por su atención

(jesus.lopezdeipina@tecnalia.com)

Agradecimientos: La participación de TECNALIA en este proyecto ha sido posible gracias a la financiación de OSALAN.

tecnalia Inspiring Business

OSALAN
Laneko Segurtasun eta Osasunerako Euskal Erakundea
Instituto Vasco de Seguridad y Salud Laborales