Under the patronage of **HRH Prince Khalid Al-Faisal**
Advisor to the Custodian of the Two Holy Mosques & Governor of Makkah Region

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المؤتمر الدولي الثاني والعشرون لإدارة الأصول والمرافق والصيانة

The 22nd International Asset, Facility & Maintenance Management Conference

Digitization - Excellence - Sustainability

A NEW AGE MAINTENANCE FOR SUSTAINABILITY IN THE INNOVATIVE INDUSTRIAL TRANSITION SCENARIO ING FRANCO SANTINI

26-28 January 2025
The Ritz-Carlton Jeddah, Kingdom of Saudi Arabia

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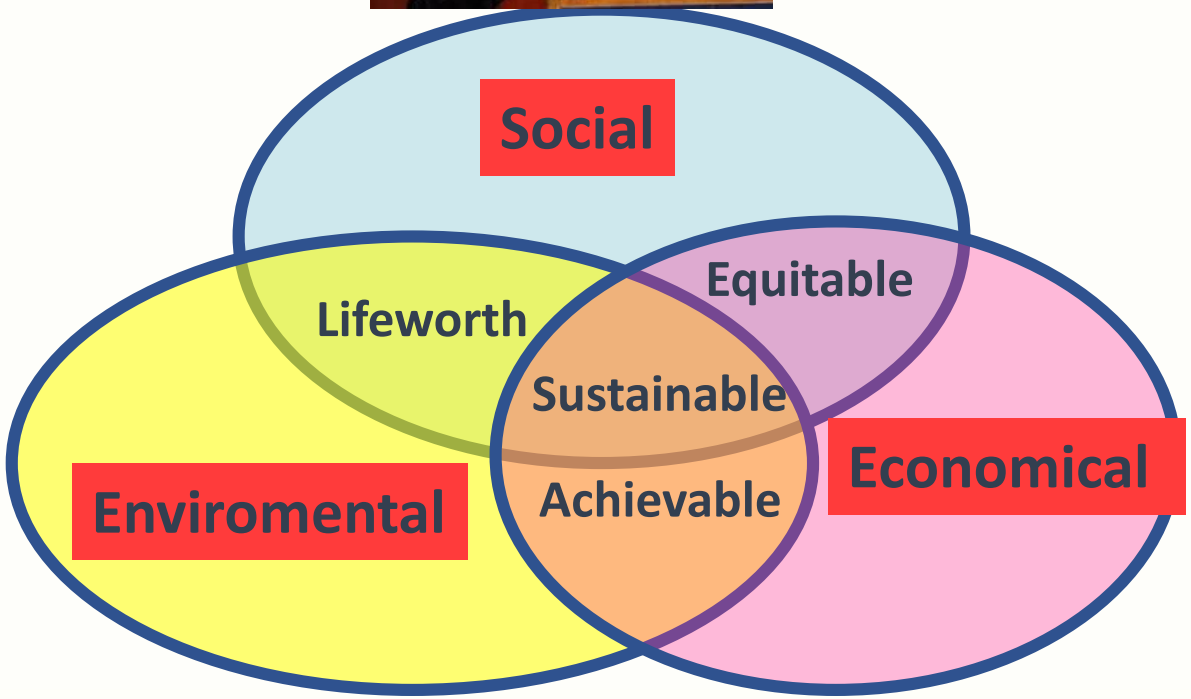
WHAT IS SUSTAINABLE DEVELOPMENT



LADY GRO HARELM BRUNTLAND PRESIDENT
UNITED NATIONS COMMISSION ON ENVIROMENT AND DEVELOPMENT
GENEVA 20 MARCH 1987

EVOLUTION OF ISO-UNI-CEN STANDARD TOWARD TO AN EXCELLENT OPERATIONAL SUSTAINABILITY OF PHYSICAL ASSETS (27 YEARS LATER)

ISO 55000:2014 ASSET MANAGEMENT .
OVERVIEW PRINCIPLES AND THERMINOLOGY

ISO 55001:2014 ASSET MANAGEMENT
SYSTEM REQUIREMENTS

ISO 55002:2014 ASSET MANAGEMENT
GUIDELINESS FOR THE APPLICATIONS

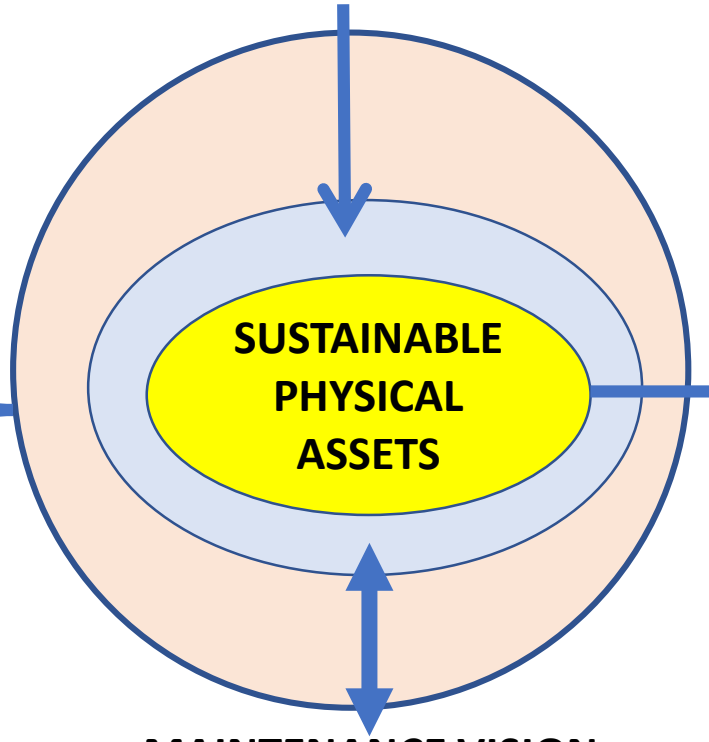
ISO 9001:2015 QUALITY MANAGEMENT SYSTEM REVISION

ISO 14001:2015 ENVIRORMENTAL MANAGEMENT SYSTEM

UNI 11454: 2012 MAINTENANCE IN DESIGN-CONSTRUCTION
OF PHYSICAL ASSES

EN 16646 :2014 MAINTENANCE
WITHIN PHYSICAL ASSET MANAGEMENT

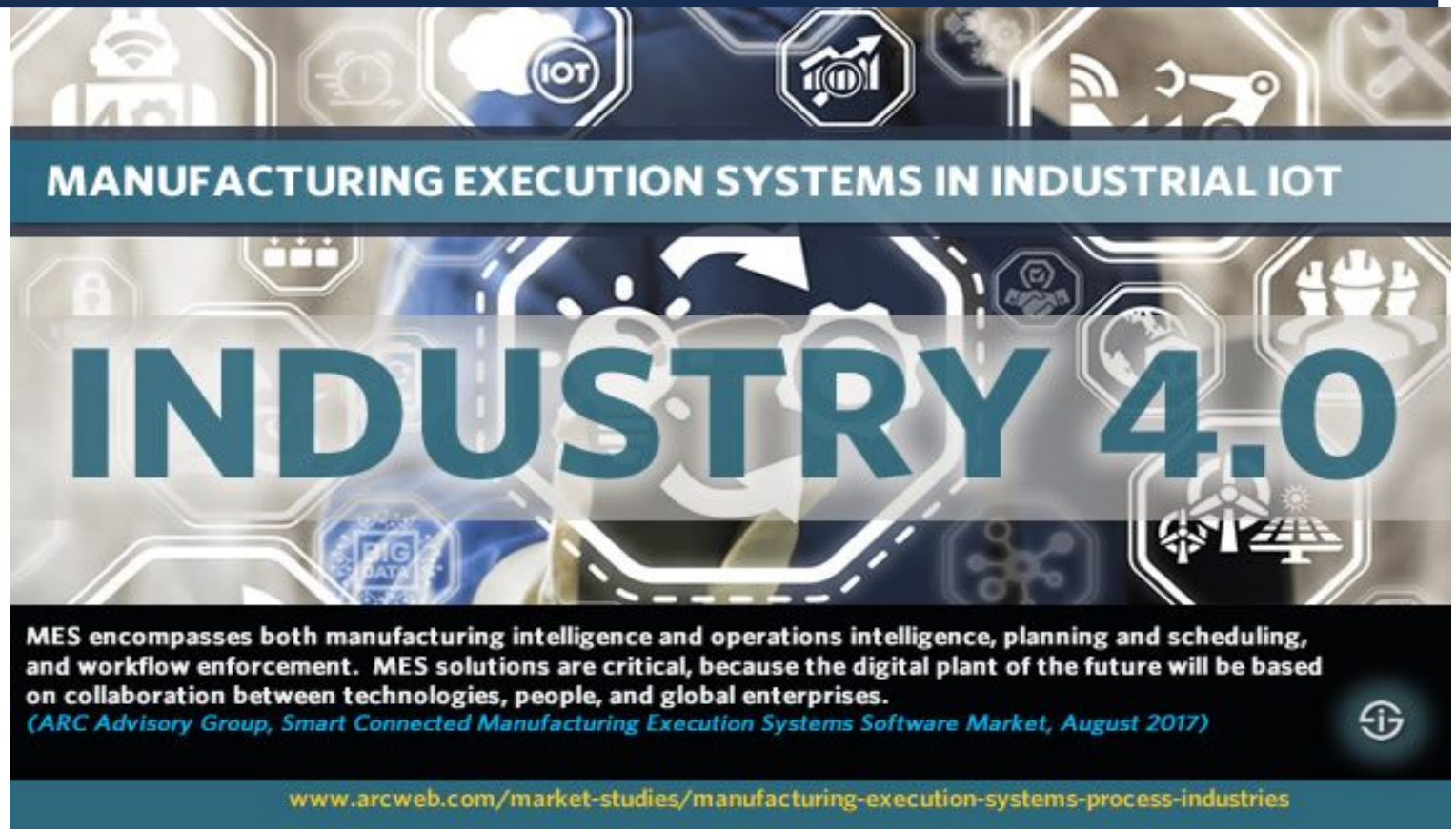
NEW PARADIGMA -CRITERIA -
COMPETENCES
OBJECTIVES -STRATEGIES -



MORE
VALUES
AND
GROWTH

MAINTENANCE VISION
TO THE ENTIRE LIFE
CYCLE
SUSTAINABILITY

INDUSTRY 4.0 THE NEW INDUSTRIAL ERA BY INTERNET OF THINGS
HANNOVER FAIR NOVEMBER 2011



IT IS THE DIGITALIZATION OF INDUSTRIAL MACHINES AND PLANTS
WHICH THROUGH INTERNET, IOT AND INFORMATIC DEVICES, NAMED ENABLING TECHNOLOGIES, ALLOWS FOR REAL TIME DECISION MAKING PROCESSES, THAT SIGNIFICANTLY IMPROVE THE TECHNICAL PERFORMANCES OF PHYSICAL ASSETS.
HENNING KAGERMANN-WOLF LUKAS (HANNOVER FAIR) 2011

INDUSTRY 4.0

FACTORY 4.0

LARGE AND INTEGRATED USE OF TECNOLOGIES 4.0 TO:

CONNECT

INNOVATE

OPTIMIZE

THE PHYSICAL ASSETS UTILIZATION

TO ACHIEVE AN EXCELLENT GOVERNANCE OF ALL INDUSTRY, FACTORIES, INFRASTRUCTURES, PRODUCTION PROCESSES - PLANTS TO REALIZE A SUSTAINABLE DEVELOPMENT

OPERATIONS & MAINTENANCE 4.0
THE MAIN INNOVATIONS

1. TO MEASURE IN REAL TIME THE INTEGRITY OF CRITICAL PHYSICAL ASSETS TO OPTIMIZE SAFETY, CAPACITY UTILIZATION AND REALIZE AN EXTENTION OF USEFUL LIFE

2. TO IMPROVE THE O.E.E OF PRODUCTION LINES ACHIEVING MORE OPERATIONAL AVAILABILITY, QUALITY AND PRODUCTIVITY.

3. TO USE THE LEARNING MACHINE TO OPTIMIZE THE PREVENTIVE MAINTENANCE ACTIONS ON CONDITION WITH PROGNOSTIC.

4. TO CONNECT MORE MACHINES TO OPTIMIZE PRODUCTIVITY

5. TO MANAGE PRODUCTION CHAINS CONNECTED-PLANNED-OPERATING, MANTAINED UNDER CONTINUOUS CONTROL IN REAL TIME.

HANNOVER
MESSE
NOVEMBER
2011

FACTORY 4.0

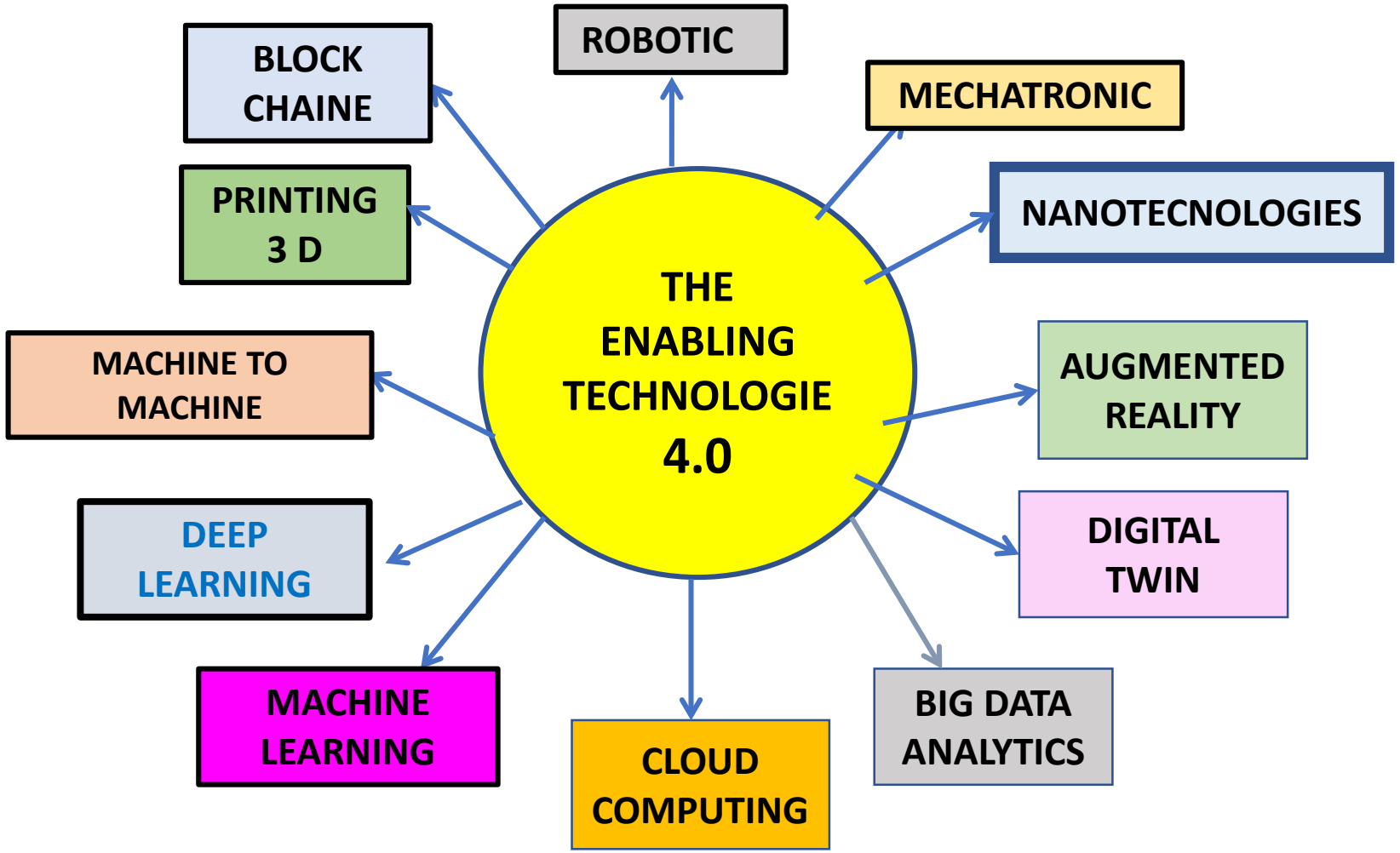
↕

MAINTENANCE 4.0

Nov.2016 FIRENZE
AIMAN CONGREES
FRANCO SANTINI

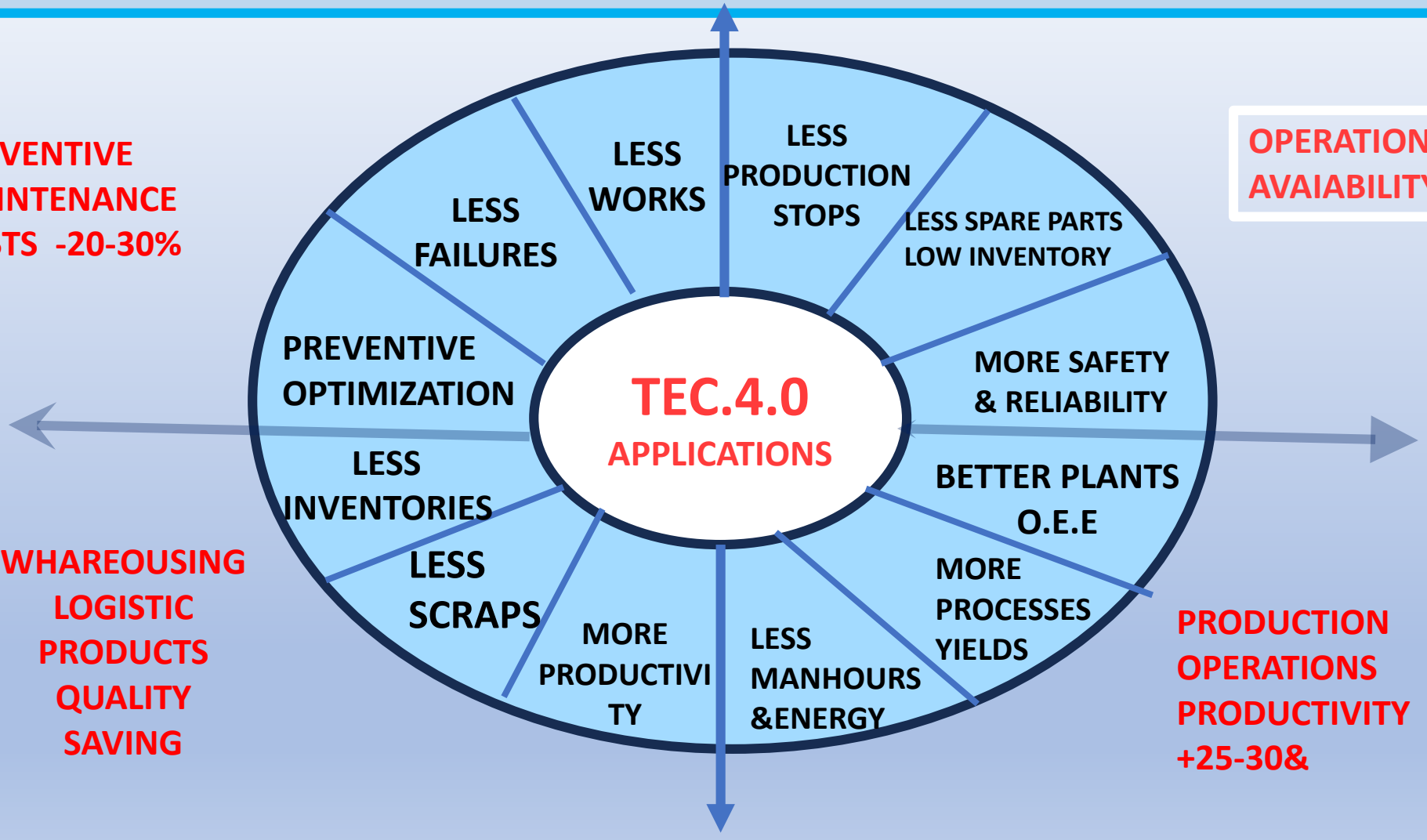
THE KOWLEDGE IN REAL TIME OF CRITICALITIES OF PHISICAL ASSETS TO OPTIMIZE THE UTILIZATION OF RESOURCES INCREASING THE MAINTENANCE SERVICES VALUES TROUGHT DIGITALIZATION AND INTEGRATED CONNECTION WITH TECNOLOGIES 4.O TO ACHIEVE SUSTAINABILITY COMPETITIVENESS- GROWTH AND AN EXCELLENT MAINTENANCE GOVERNANCE

THE ENABLING TECHNOLOGIES MAINTENANCE 4.0



MAINTENANCE IS A FUNCTION AT HIGH INTENSITY OF DATA AND CONSEQUENTLY IT IS DATA DRIVEN

ESTIMATED RANGE OF BENEFITS FROM TECHNOLOGIES 4.0 APPLICATIONS ON MAINTENANCE AND OPERATIONS (SOURCES INTENATIONAL SURVEYS)



MULTI FACTORS AND OBJECTIVES OF SUSTAINABLE INDUSTRIAL TRANSITION SCENARIO 2020-2035

ONU SUSTAINABLE DEVELOPMENT GOALS 2030

WHAT IS ESG

ENVIRONMENTAL

Climate change strategy,
Biodiversity,
Water efficiency,
Energy efficiency,
Carbon intensity,
Enviromental
management system

PROTECTION

SOCIAL

Equal opportunities,
Freedom of association,
Health and safety,
Human rights,
Customer &
products resposibility,
Child labour

SOCIAL INCLUSION

GOVERNANCE

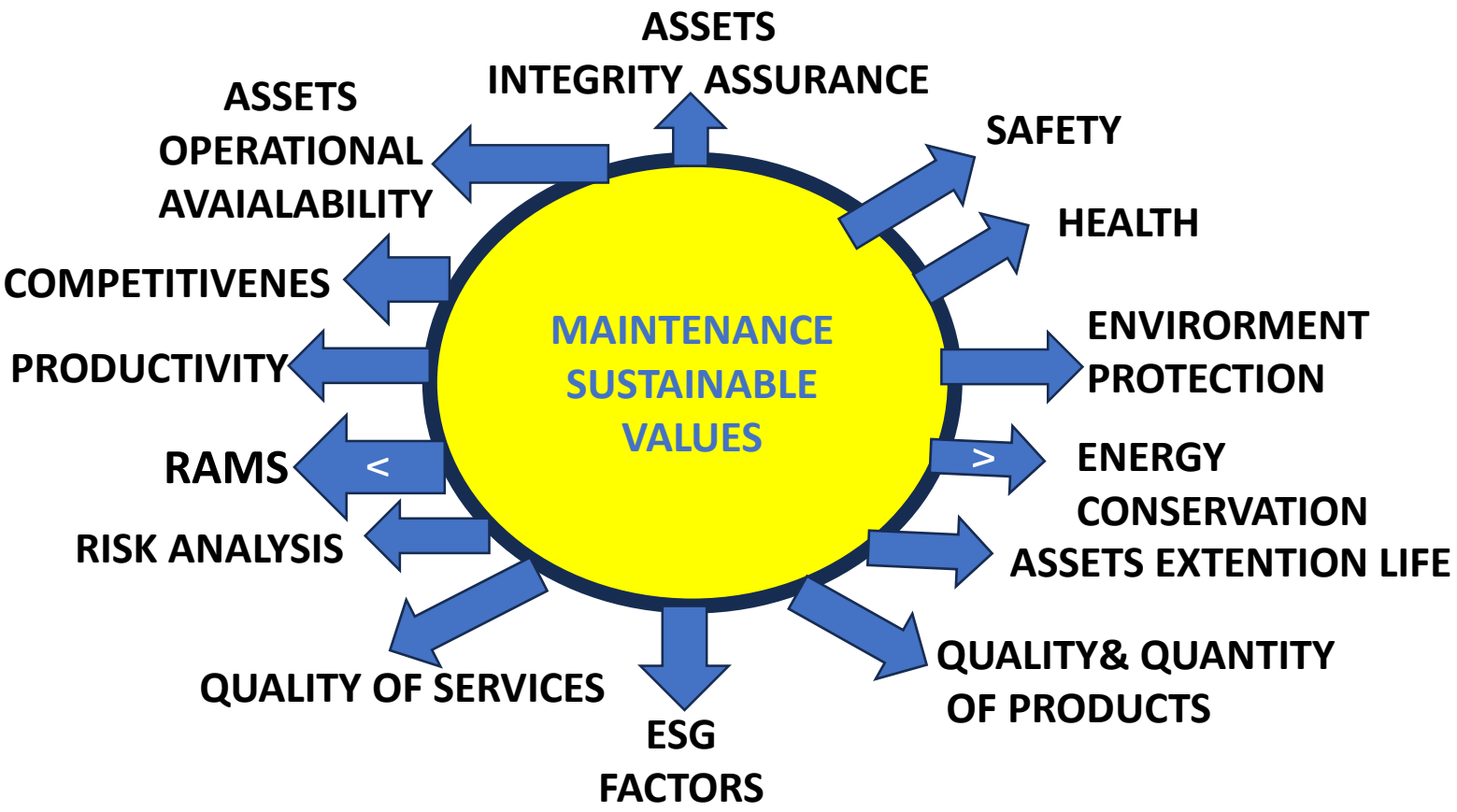
Business ethics,
Compliance,
Board independence,
Executive compensation,
Shareholder democracy

Competitiveness and Growth

EXCELLENT OPERATIONS &MAINTENANCE

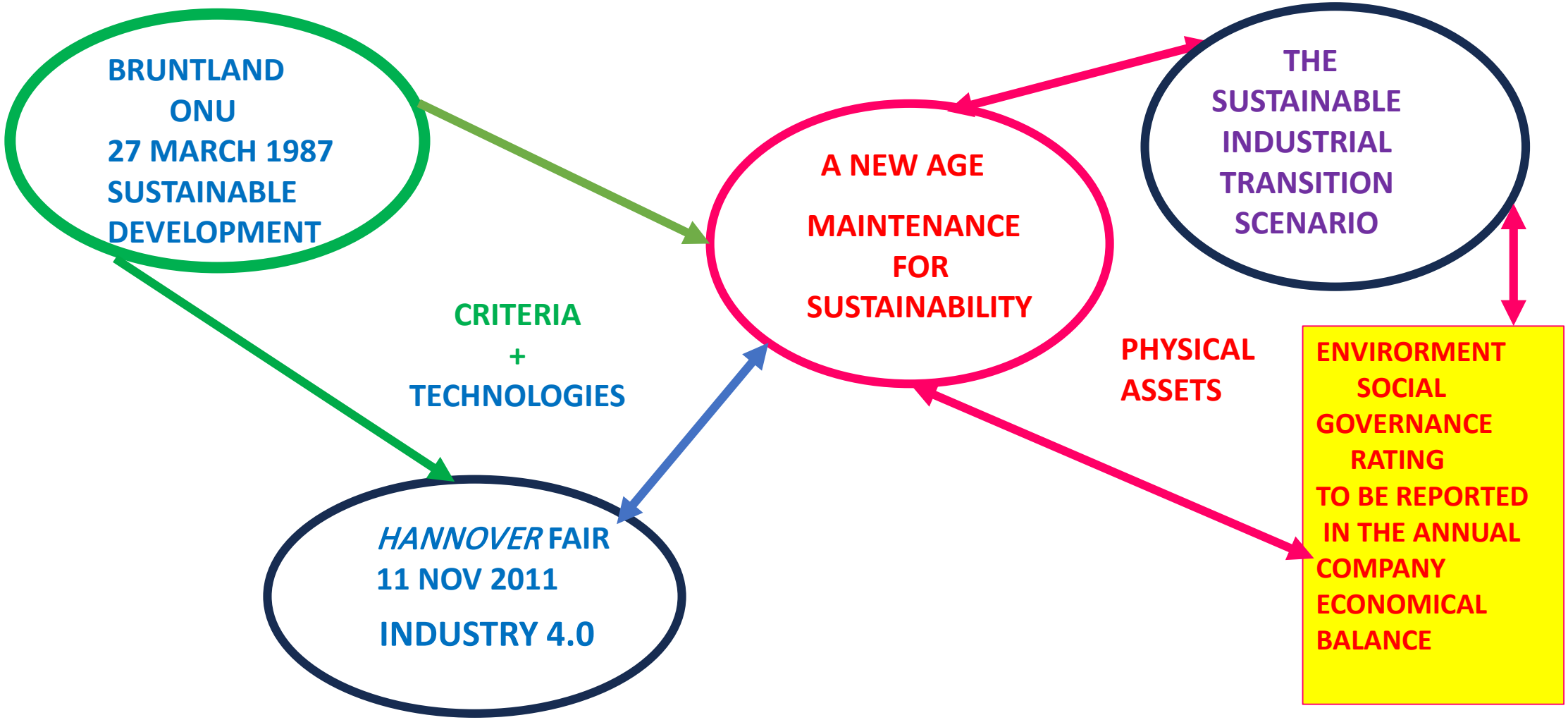
BECAUSE THE ESG FACTORS ARE THE COMPONENTS OF SUSTAINABILITY, IT IS NECESSARY TO CREATE A SYSTEMS TO MEASURE THE STATUS OF EACH FACTOR TO EVALUATE THE FACTORY GLOBAL ESG RATING.
IN THIS FRAMEWORK MAINTENANCE IS THE MORE APPROPRIATE FUNCTION TO USE THE SYSTEM BECAUSE IT IS ALREADY COMMITTED TO IMPLEMENT APPROPRIATE MAINTENANCE STRATEGY, TO MAINTAIN AND IMPROVE THE PHYSICAL ASSETS PERFORMANCES TO GENERATE THE EXPECTED SUSTAINABLE VALUES FROM AN EXCELLENT OPERATION OF PHYSICAL ASSETS.

MAINTENANCE IS A GENERATRIX OF SUSTAINABLE VALUES

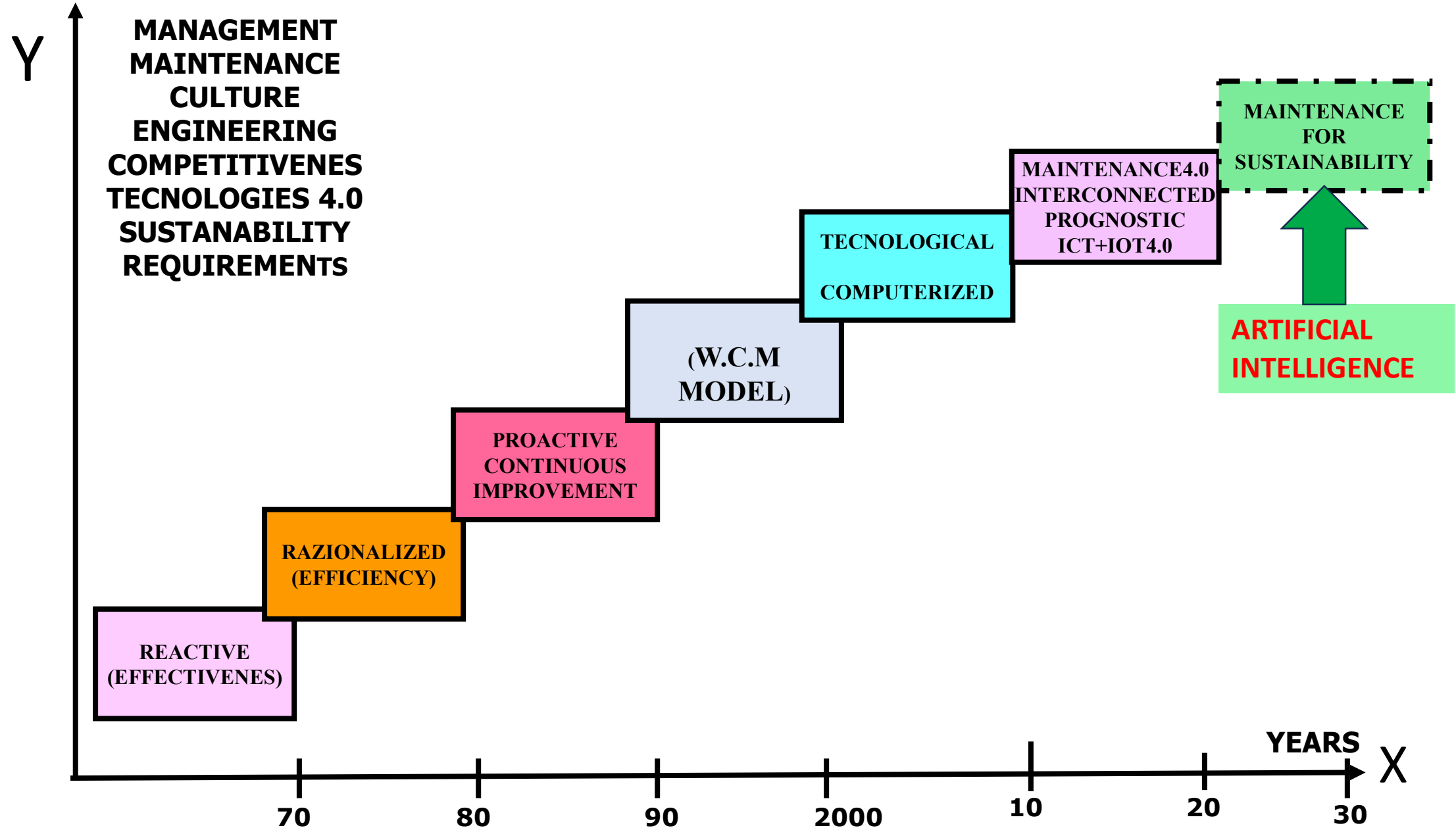


IN **THIS FRAMEWORK MAINTENANCE BECOMES A KEY STRATEGIC PROFITABLE FUNCTION FOR THE COMPANY BECAUSE TO ACHIEVE AND MANTAIN AN EXCELLENT ESG MEANS TO INCREASE THE VALUE OF THE COMPANY, THE BUSINESS, THE CREDIBILITY, THE ESTIMATION OF MANAGEMENT AND TO OBTAIN A PROFITABLE GROWTH**.

MAINTENANCE FUNCTION FOR A SUSTAINABLE PHYSICAL ASSETS DEVELOPMENT

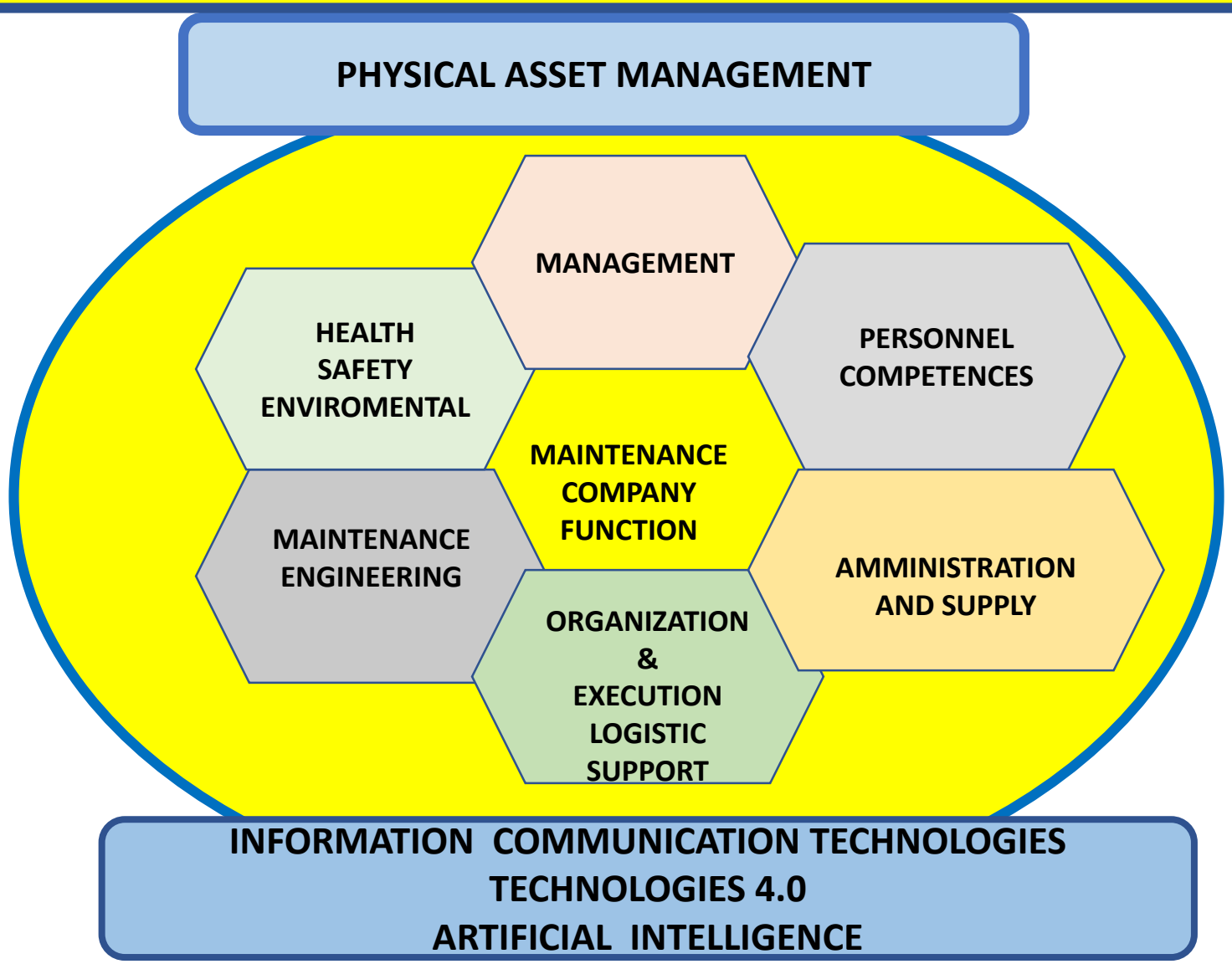


MAIN PHASES OF EVOLUTION OF MAINTENANCE FUNCTION



MAINTENANCE COMPANY FUNCTION AND CORE FRAMEWORK

EN15341:2019 183 KPI KEY PERFORMANCE INDICATORS



MAIN MAINTENANCE OBJECTIVES
«PHYSICAL ASSETS SUSTAINABILITY AND RELATED FACTORS»

INTEGRITY
AVAILABILITY
SUSTAINABILITY
EXTENSION LIFE
OF PHYSICAL ASSETS

PHYSICAL ASSETS
PERFORMANCES ESG RATING
MAINTENANCE COSTS

PHYSICAL ASSETS

HSE +STANDARD
CEN- ISO

COMPETENCES
PREVENTIVE
MAINTENANCE

TECNOLOGIES 4.0
ARTIFICIAL
INTELLIGENCE

CHAT GPT
NOV. 2022
OPEN I

TO EVALUTE THE ESG RATING IN A FACTORY

AREAS-FUNCTION SUB FUNCTIONS , PHYSICALASSETS , FACILITIES, MATERIALS TO BE CONSIRED INFLUENCING FACTORST OF SUSTAINABILITY LEVEL ARE AS EXAMPLE:

- RESEARCH &DEVELOPMENT
- HUMAN RELATIONS
- ADMINISTRATION-ACCOUNTING
- HEALT-SAFETY-ENVIRORMENT
- PROCESSES-PRODUCTS QUALITY
- DESIGN CONSTRUCTION ENGINEERING
- PRODUCTION- PROCESSES
- UTILITIES AND ENERGY
- MAINTENANCE
- LOGISTIC
- RAW MATERIALS
- SUPPLY CHAINE
- MANAGEMENT GOVERNANCE.

KEY PERFORMANCE INDICATORS

KEY ESG INDICATORS

ESG RATINGS PHYSICAL ASSETS FACTORY/COMPANY

THE MAIN OBJECTIVES ARE TO ACHIEVE ANEXCELLENT GOVERNANCEOF OPERATIONS AND MAINTENANCE OF PHYSICAL ASSETS.

WHAT IS A STANDARD

EUROPEAN DIRECTIVE 98/34/CE OF 22JUNE 1998

A STANDARD IS A TECHNICAL AND ORGANIZATIONAL DOCUMENT APPROVED BY AN ENTITY RECOGNIZED BY THE AUTHORITY, THAT DEFINES THE RULES, GUIDELINES, RESOURCES AND ALL REQUIRED SPECIFICATIONS, PROCEDURES, METHODOLOGY, SISTEMS TO EXPLAIN HOW IT IS CORRECT TO DO AN ACTIVITY, A PRODUCT, A SERVICE.

THE CEN COMMITTE EROPEEN DE NORMALIZATION IS THE RECOGNIZED EUROPEAN ENTITY to provide standard in many areas through variuos working groups of European body. The Cen EU Technical Committe319 Maintenance is working from1961.The Secretary is held by UNI Italian Normalization body. The European national bodies participants with their experts are 22. Under my responsability as Chairman from October 2010 untill December 2024, the Committee published 15 standard that are covering the main fundamental contents of Maintenance Function. Efnms that represents all the European Maintenance National Society from March 2023 has a Liason Partnership with Cen TC 319 Maintenance to contribute to development of maintenance culture.

.15 MAINTENANCE STANDARD AVAILABLE FOR IMPLEMENTATION

MANAGEMENT	PrEN17948:2024 MAINTENANCE MANAGEMENT and FUNCTION
	EN16646:2017 MAINTENANCE WITHIN PHYSICAL ASSET MANAGEMENT
	EN17485 :2021 FRAMEWORK IMPROVING VALUE OF PHYSICAL ASSETS
	EN15331:2011 MAINTENANCE SERVICES FOR BUILDING
COMMOM BASIS	EN133062017 MAINTENANCE TERMINOLOGY
	EN17007: 2017 MAINTENANCE PROCESS
RESOURCES	EN13269:2016 CONTRACT MAINTENANCE
	EN 13460:2015 DOCUMENTATION FOR MAINTENANCE
	EN 15628 :2014 QUALIFICATION OF MAINTENANCE PERSONNEL
METHODOLOGIES	EN17666:2022 MAINTENANCE ENGINEERING REQUIREMENTS
	EN15341:2019 KEY PERFORMANCES INDICATORS
	EN17840 PERFORMANCES AND CONDITION ASSESSMENTFOR BUILDINGS
	CEN TS17385:2019 CONDITION ASSESMENT
	EN16991 :2018 RISK-BASED INSPECTION FRAMEWORK
	prEN17975:2023ENERGY AND FLUIDS RISKS FOR MAINTENANCE TASKS

PILLAR ONE
TO ADOPT A COMMOM MAINTENANCE TERMINOLOGY

- **EN13306:2017**
- **MAINTENANCE PROCESSES EN 17007:2017**

THE IMPLEMENTATION OF NEW TECHNOLOGIES AND THE PRESENTATION OF THE MAINTENANCE ORGANIZATION OFTEN ARE USING TERMINOLOGIES NOT IN LINE WITH THE STANDARD DEFINITION, CREATING NOT HOMOGENEOUS INTERPRETATIONS AND MISLEADING COMMUNICATIONS.

IT IS RECCOMMENDED TO USE THE STANDARD DEFINITION OF VARIOUS KIND OF MAINTENANCE ACTIVITIES ALSO TO USE THE STANDARD KPI.

PILLAR TWO TO DEVELOP MAINTENANCE ENGINEERING ADOPTING APPROPRIATE CRITERIA AND METHODS SEE EN UNI17666.2022 MAINTENANCE ENGINEERING REQUIREMENTS

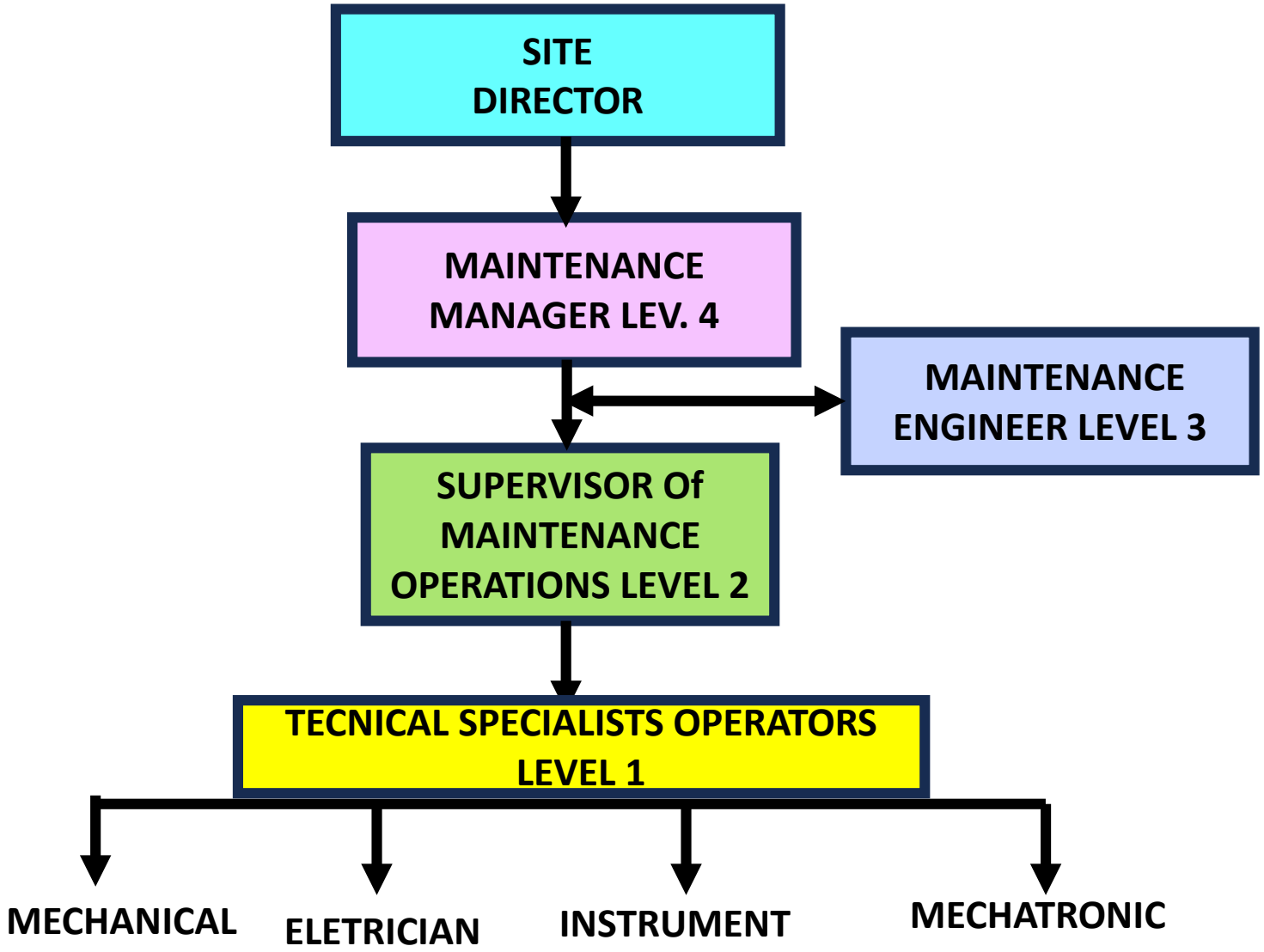
WHAT IS MAINTENANCE ENGINEERING EN17666:2022.

MAINTENACE ENGINEERING DISCIPLINE, APPLYING COMPETENCIES, METHODS, TECHNIQUE AND TOOLS TO DEVELOP AND SUPPORT MAINTENANCE IN ORDER TO ASSURE THAT A ITEM OR A PHYSICAL ASSETS, IS SUSTAINABLE AND COST- EFFECTIVE THROUGH ALL THE LIFE CYCLE TO PERFORM THE REQUIRED FUNCTIONS .

THE MAINTENANCE ENGINEERING COMPETENCES WILL BE MAINTAINED TROUGH CONTINUOUS PROFESSIONAL DEVELOPMENTS , USING ALL SUITABLE INNOVATIONS 4.0.

MAINTENANCE ENGINEERING MAKES USE OF BASIC KNOWLEDGE AND SCIENCES (MATEMATICS, PHISICS, CHEMISTRY AND BIOLOGY) AS WELL AS OTHER AREAS OF ENGINEERING (CIVIL, MECHANICS, MATERIALS , MECHATRONICS, ELETCTROTECNICS INFORMATIC DATA ANALYSIS, etc.)

ORGANIZATION STRUCTURE OF MAINTENANCE FUNCTION
(MODEL FACTORY MEDIUM SIZE)



INTRINSIC CHARACTERISTICS OF PHYSICAL ASSET

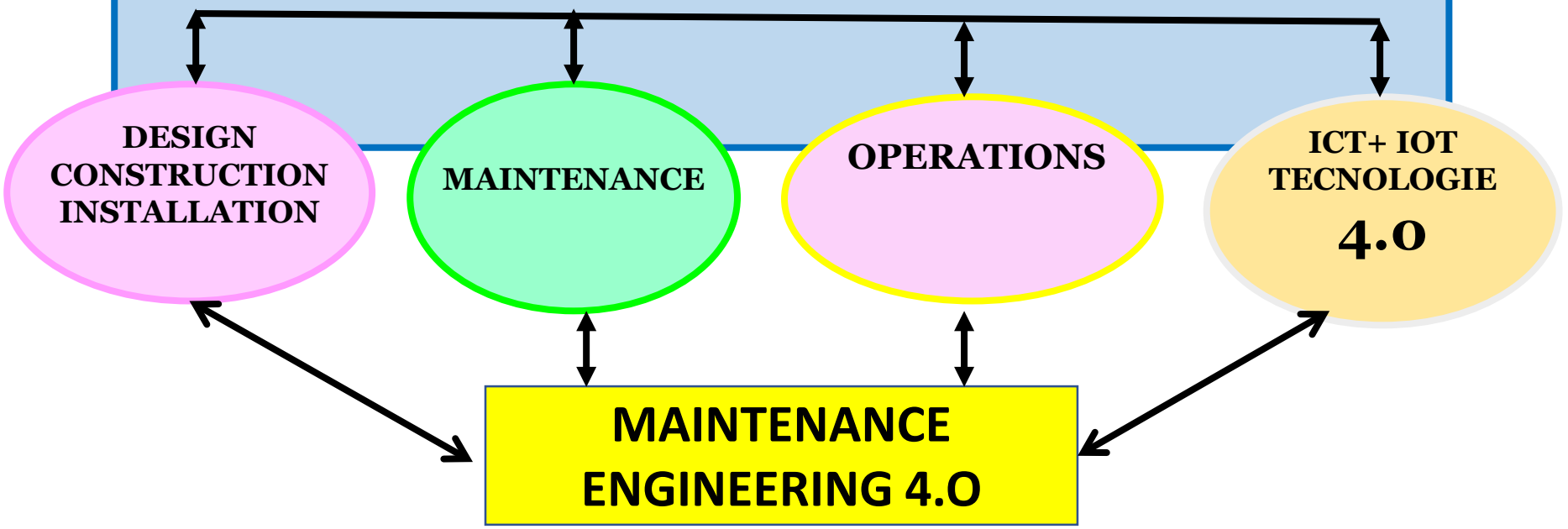
R	RELIABILITY	PROBABILITY TO RUN CORRECTLY FOR PREDEFINED PERIOD OF TIME
A	AVAILABILITY	$\frac{\text{TIME RUNNING CORRECTLY}}{\text{REQUESTED TIME TO RUN CORRECTLY}}$
M	MAINTENABILIY	MEAN TIME TO RESTORE A PHYSYCL ASSET AFTER A FAILURE
S	SUSTAINABILITY	THE ESG RATING ACHIEVED THE PLAN TO IMPROVE

PILLAR THREE
PHYSICAL ASSET MANAGEMENT INCLUDES
THE IMPLEMENTATION OF MAINTENANCE ENGINEERING4.0

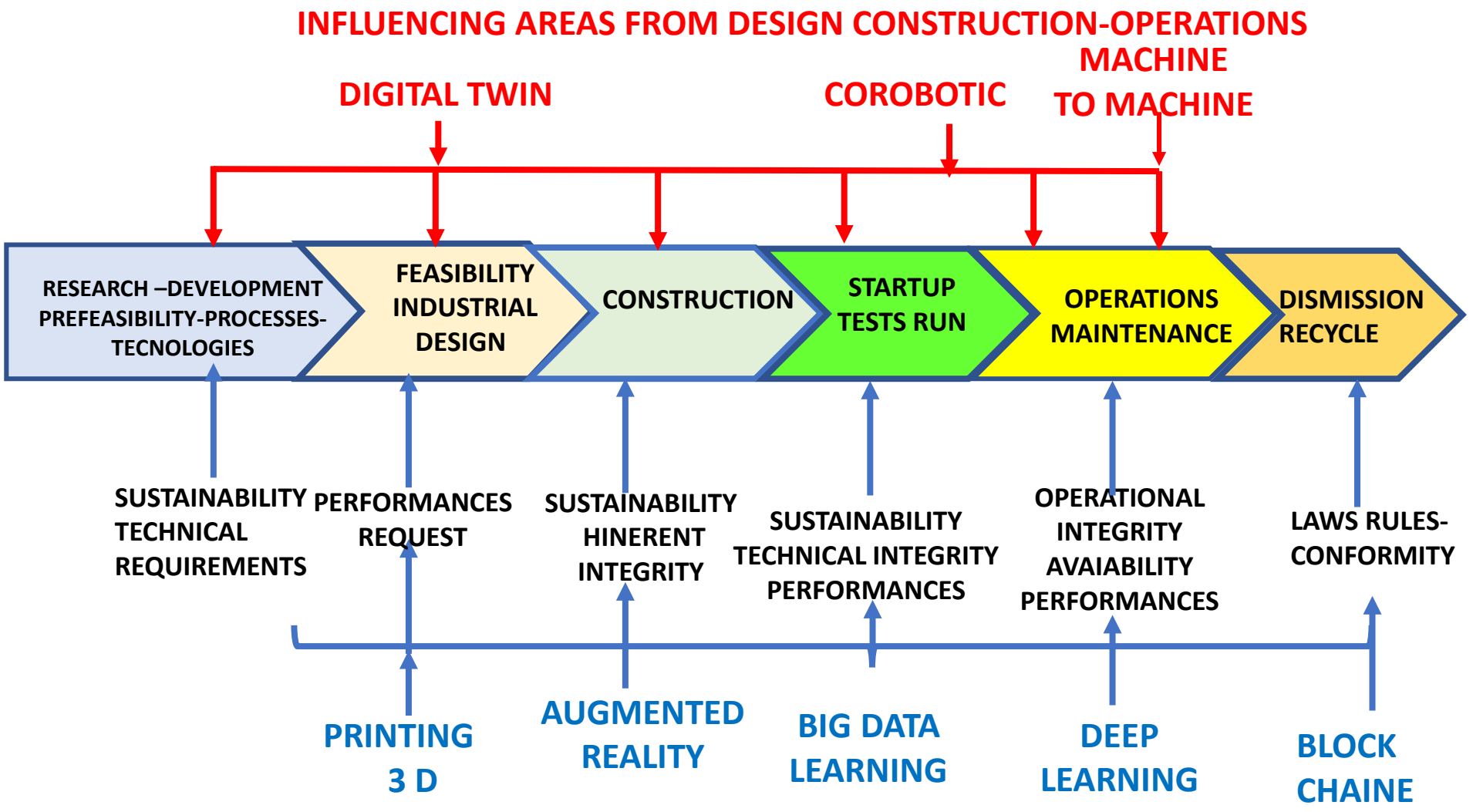
TO HANDLE THE LIFE CYCLE ACHIEVING

THE ASSIGNED OBJECTIVES

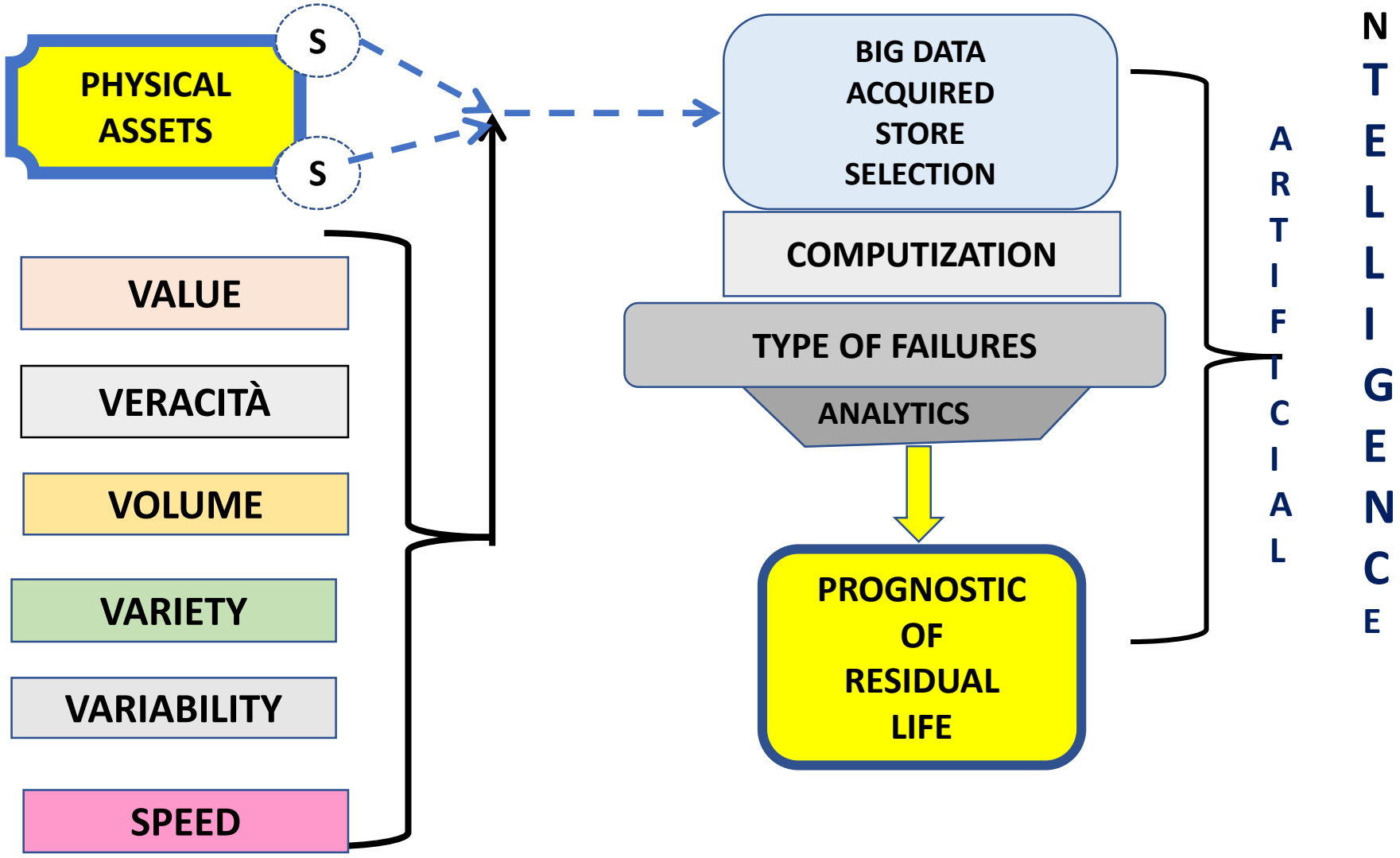
IN THE REQUIRED SUSTAINABLE FRAMEWORK



UTILIZATION OF TECNOLOGIES 4.0 DURING LIFE CYCLE TO ACHIEVE A SUSTAINABLE PHYSICAL ASSETS



PILLAR FOUR FROM BIG DATA TO LEARNING MACHINE TO THE PREVISION OF RESIDUAL LIFE BY ARTIFICIAL NTELLIGENCE



PROGNOSTIC MAINTENANCE 4.0

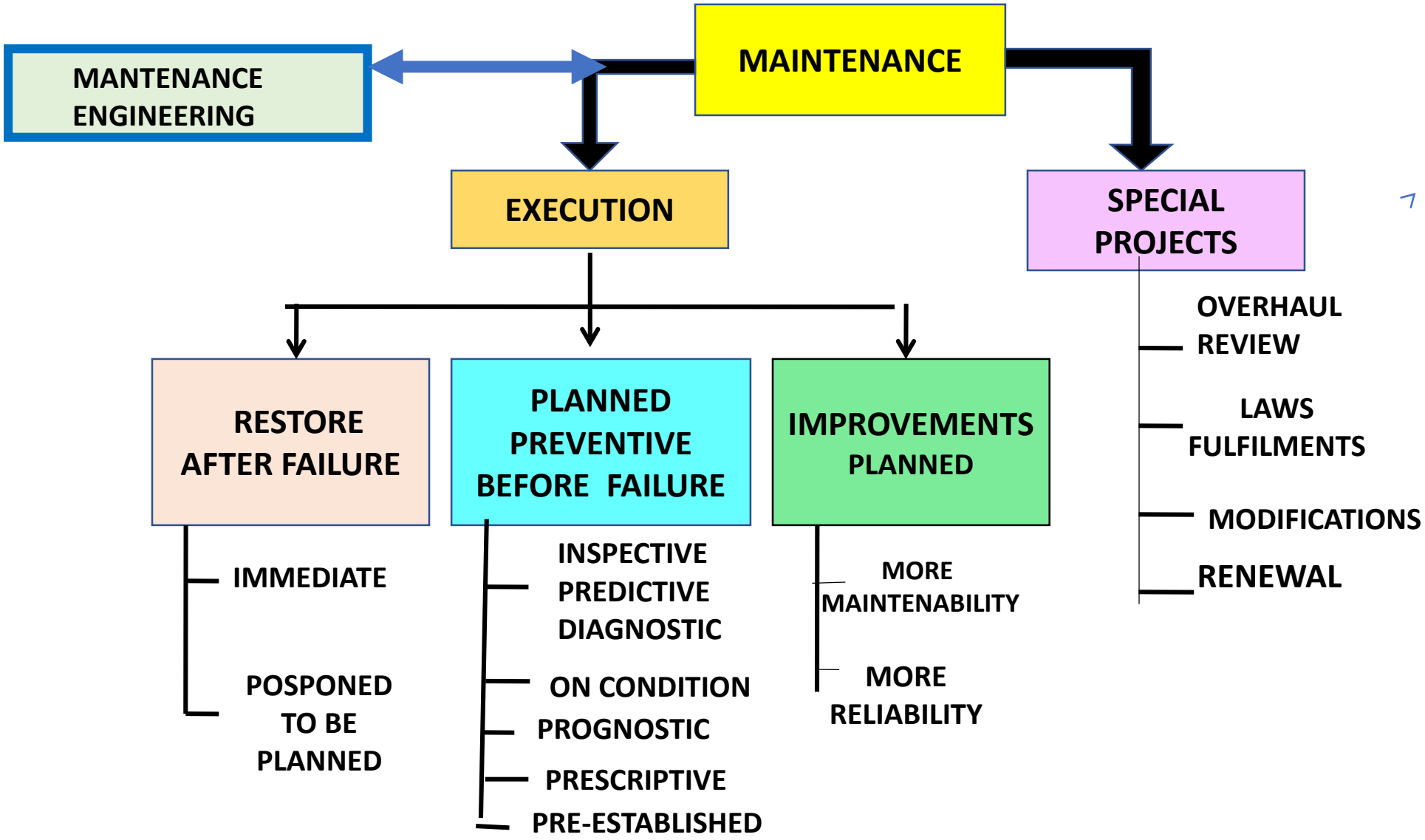
BASED ON MAIN TECHNICAL CARACTERISTICS OF CRITICAL COMPONENTS OF EQUIPMENTS AND MACHINES, THE LEARNING SYSTEMS CAN COLLECT SIGNIFICATIVE BIG DATA TO EVALUATE, THROUGH PROGNOSTIC ALGORITMS, THE RESIDUAL USEFUL LIFE TO OPTIMIZE THE PREVENTIVE ACTIONS, REDUCING OPERATING LOST TIME AND COST OF RESTORE

PRESCRIPTIVE MAINTENANCE

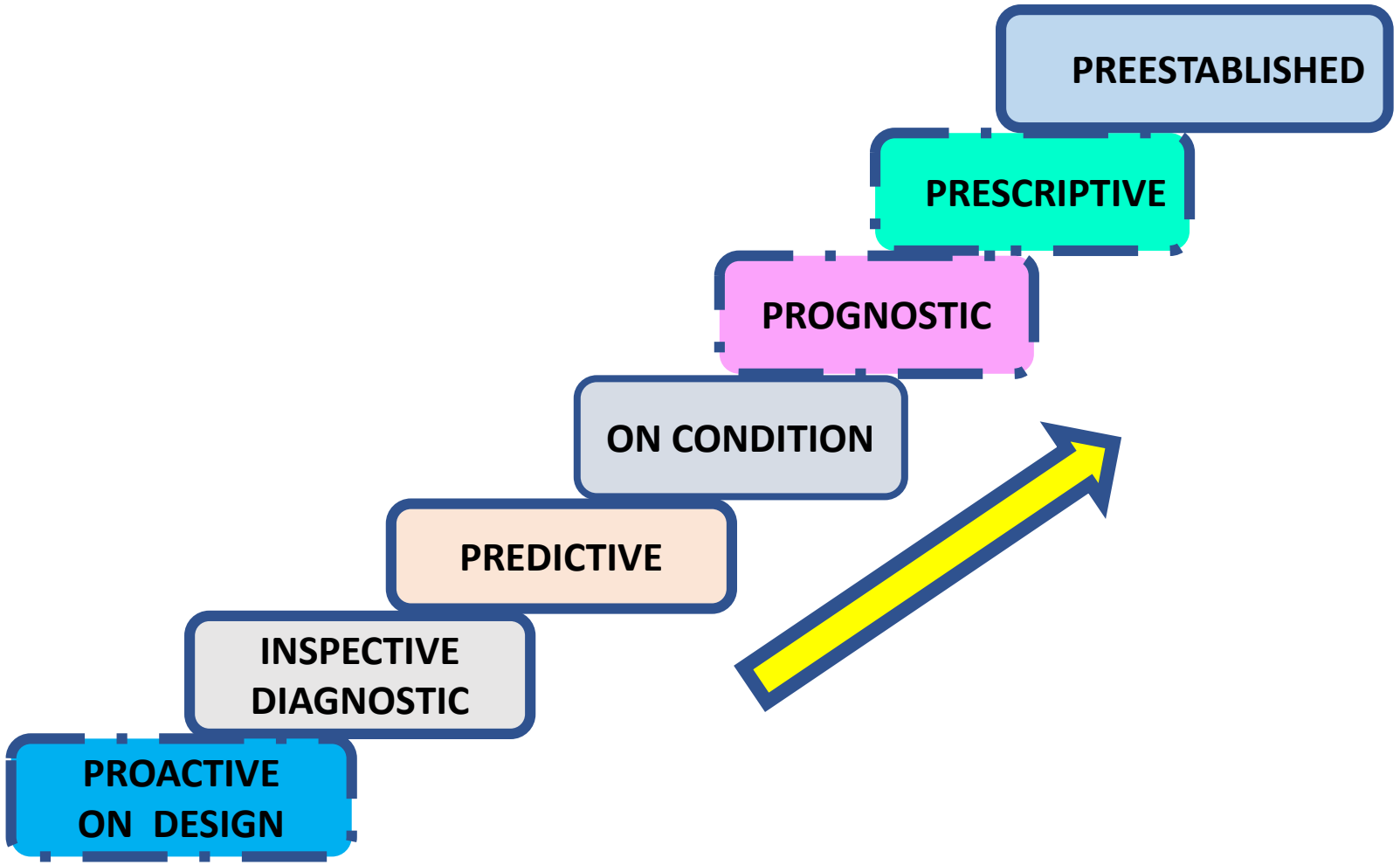
DEFINITION OF THE BEST STANDARD PROCEDURES FOR PHYSICAL ASSET UTILIZATION, TO MAINTAIN THE BEST OPERATIONAL INTEGRITY AND OPERATIONAL AVAILABILITY, TROUGH

THE BEST AVAILABLE PREVENTIVE PRACTICES

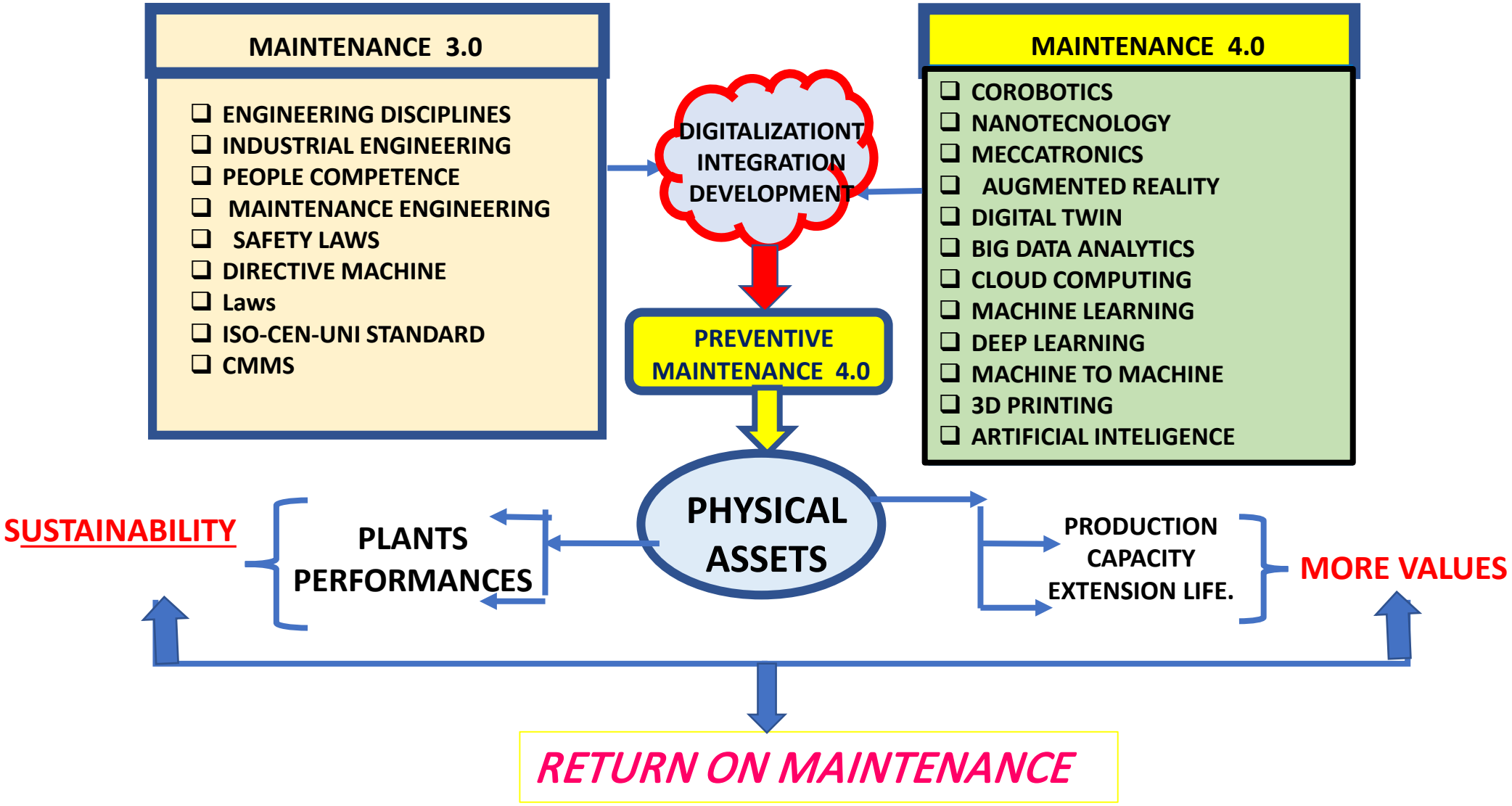
MAINTENANCE STRUCTURE UNI 10147,EN 13306



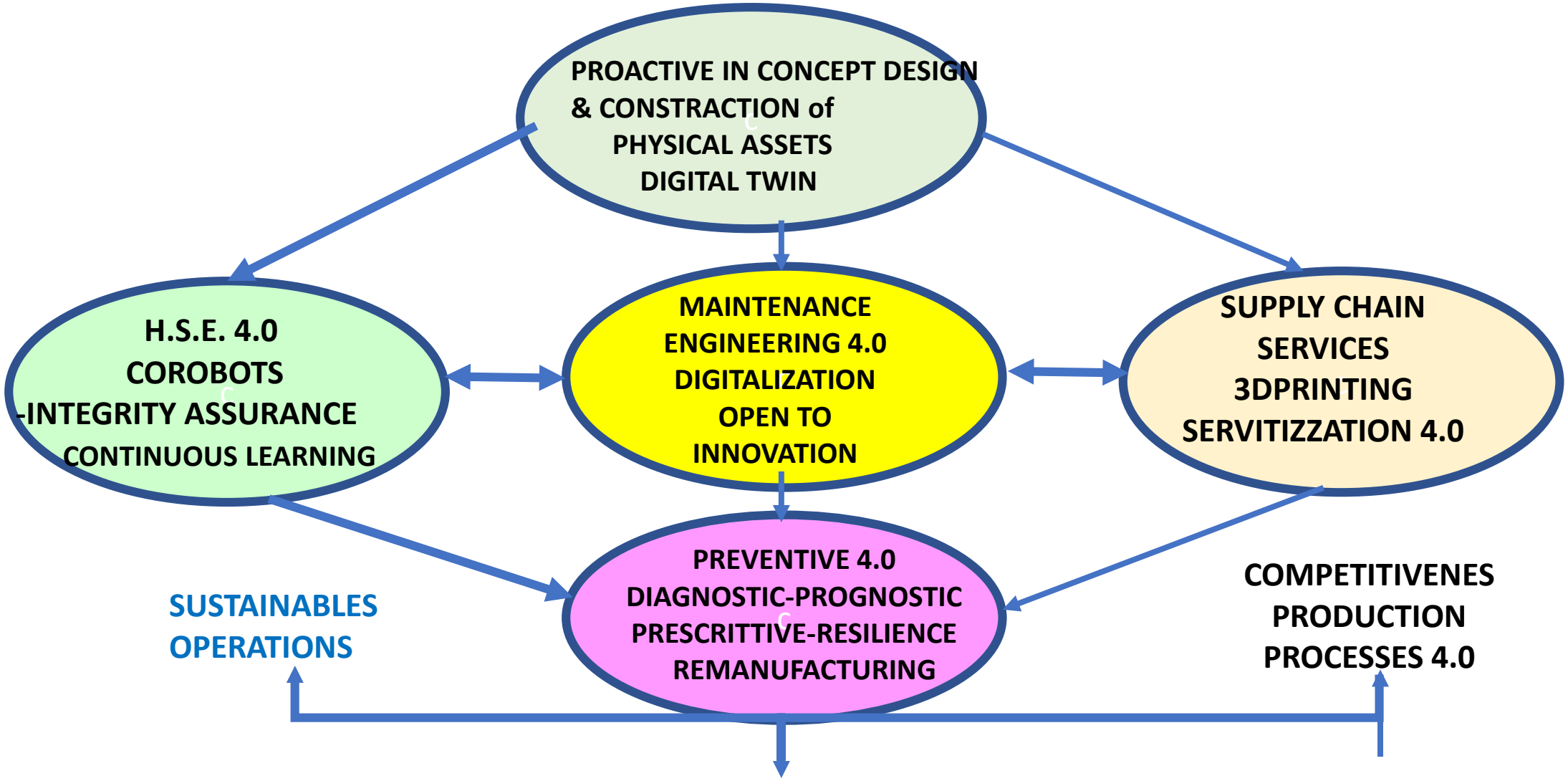
PILLAR FIVE THE EVOLUTION OF TYPES OF PREVENTIVE MAINTENANCE



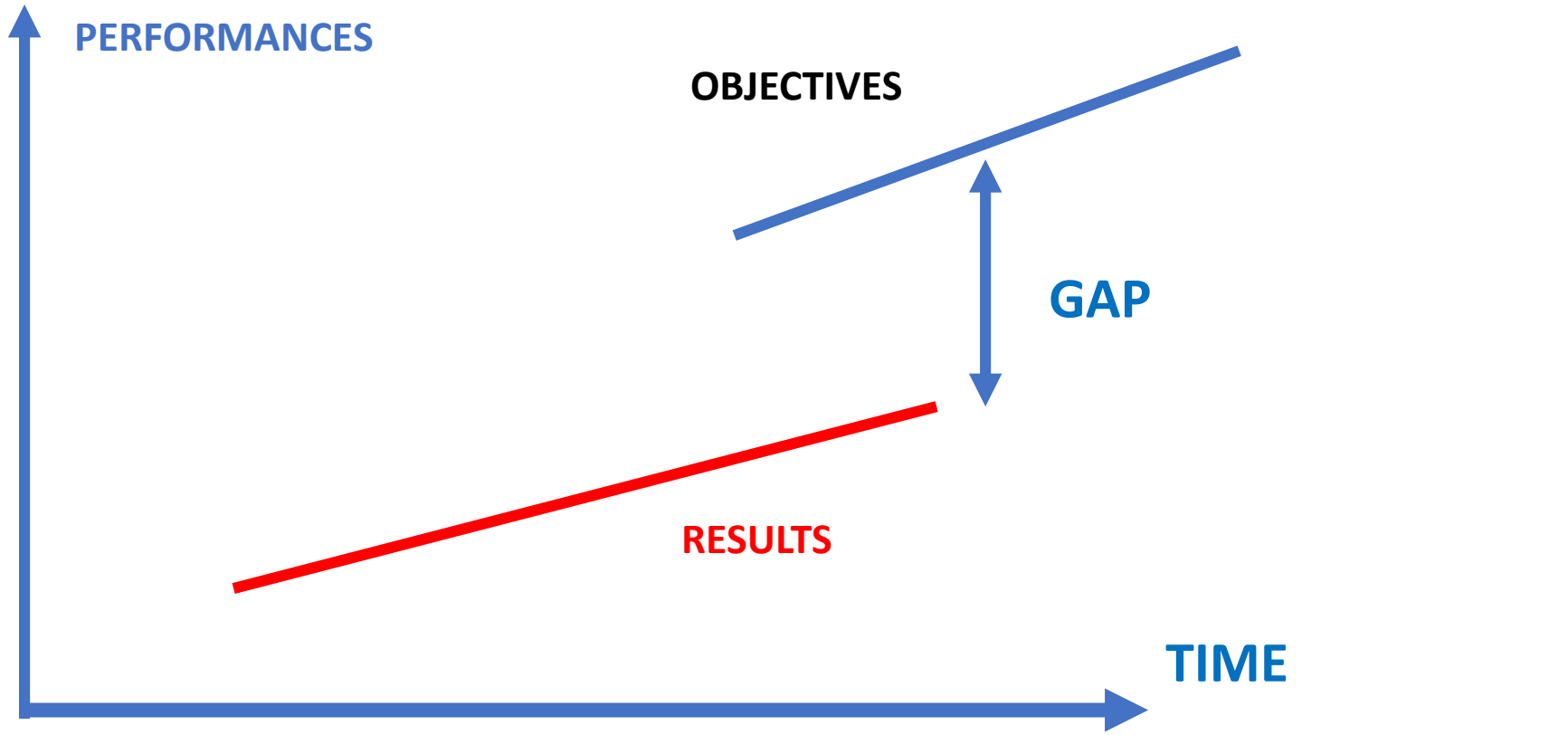
PILLAR 6 FROM MAINTENANCE 3.0 TO MAINTENANCE 4.0



PILLAR 7 IMPLEMENT PREVENTIVE 4.0 TO ACHIEVE ASSET MANAGEMENT 4.0

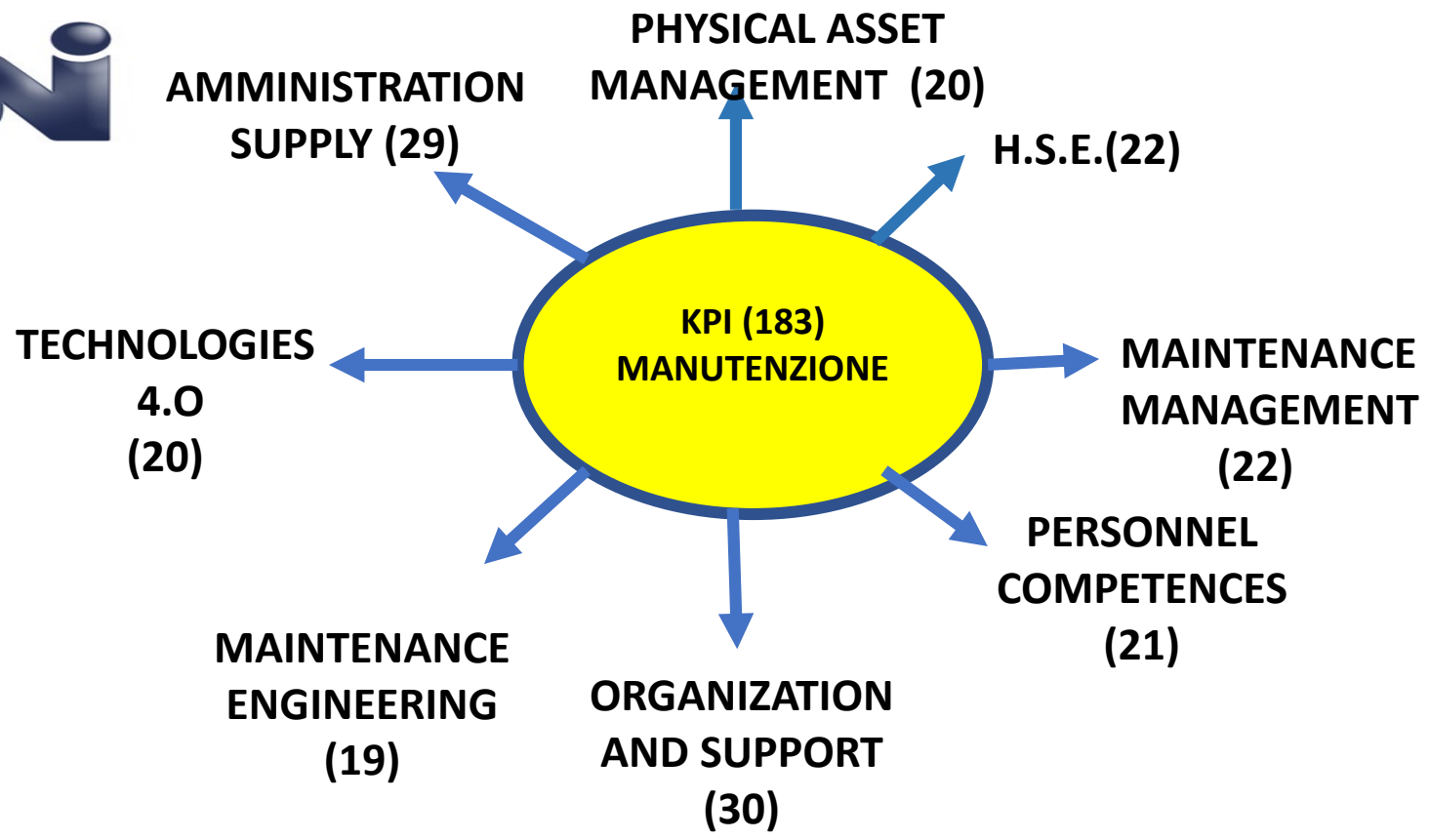


PILLAR 8 TO ACHIEVE THE MOST EFFECTIVE MAINTENANCE SUB FUNCTIONS MEASURING THE PERFORMANCES WITH APPROPRIATE KPI SEE EN15341:2019 KEY PERFORMANCE INDICATORS

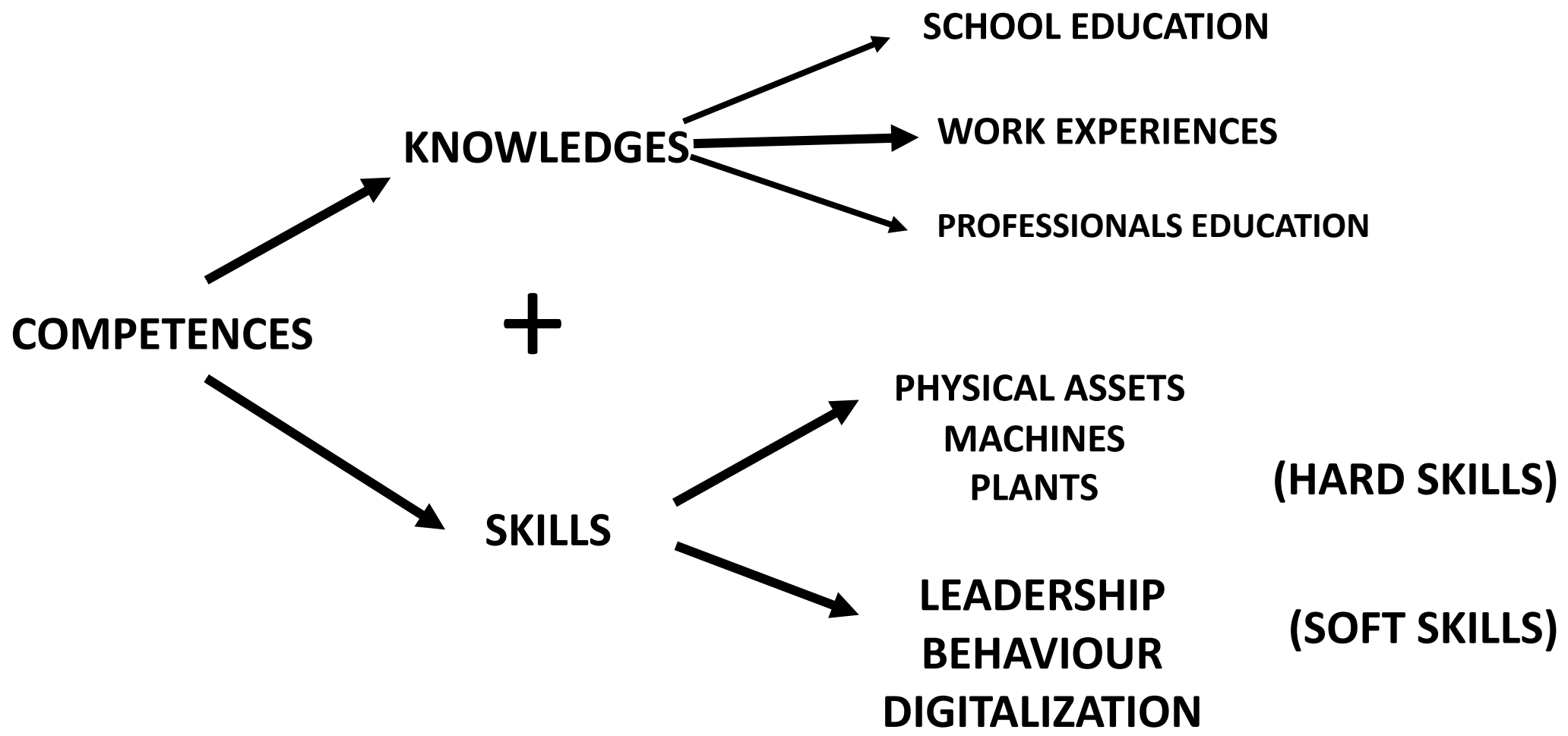


TO KNOW THE REASONS OF THE GAP TO IDENTIFY WHY AND HOW TO IMPROVE

183 MAINTENANCE FUNCTION KPI
SEE EN 15341 2019 KEY MAINTENANCE INDICATORS



PILLAR 9 QUALIFICATION OF MAINTENANCE PERSONELLS EN 15628.2014



PILLAR 9

QUALIFICATION

OF MAINTENANCE KEY PERSONS

EN15628:2014 AND SUBSEQUENT

CERTIFICATION RECOMMENDED

IN CASE OF MAINTENANCE COMPANY

PROVIDING SERVICES

MAINTENANCE IS THEORY AND PRACTICE

THE THEORY REINFORCES THE KNOWLEDGE,
THE PRACTICE DEVELOPS THE OPERATIONS RULES.
TOGHETER THEY CAN
ACHIEVE AND MAINTAIN

AN EXCELLENT PHYSICAL ASSETS SUSTAINABILITY

THANKS FOR YOUR ATTENTION
JEDDAH. 27 JANUARY 2025. FRANCO SANTINI

THE END

ASSET TERMINOLOGY

WHAT IS AN ASSET

THE ISO DEFINED ASSET :

AN ITEM, THING OR ENTITY THAT HAS POTENTIAL OR ACTUAL VALUE.

.

PHYSICAL ASSET

BECAUSE ISO 55000 DOES NOT PROVIDE ANY SPECIFIC DESCRIPTION REGARDING THE CHARACTERISTIC OF AN ASSET IN THE AREAS OF ENGINEERING, CONSTRUCTION AND MAINTENANCE, THE CEN EN 16646:2014 MAINTENANCE WITHIN ASSET MANAGEMENT POINTED THE TERM PHYSICAL ASSET IN THE CASE OF MACHINERY, PLANTS, BUILDING, INFRASTRUCTURES, EQUIPMENT FACILITIES AND SIMILAR ITEM.