General

ID[1]				
Use case name	Improving Productivity for Warehouse Operation			
Application domain	Logistics			
Deployment model	On-premise systems			
Status	PoC			
Scope[2]	Big data analysis for enhancing productivity			
Objective(s)	To improve productivity of warehouse operation by detecting and changing controllable factors			
Narrative	Short description (not more than 150 words)	AI-driven operating system that uses big data from work performance information to issue appropriate work instructions has been developed. In PoC, picking operation improvement was conducted in a distribution warehouse. As the result, 8% work reduction was performed.		
	Complete description	Attempts are being made to increase the efficiency of work improvements through more widespread application of IT to work systems. However, as each new improvement is added or improvements are made with respect to environmental changes, it requires manual changes to the system, leading to increases in work improvement costs. This case has developed an AI system that uses big data such as work performance information, to understand worksite improvements and environmental changes and issue appropriate work instructions. It has conducted a demonstration test, which confirmed the effectiveness of this system for improving distribution warehouse work. In the future, we will continue to work on expanding the AI system to a wide range areas such as manufacturing and distribution.		
Stakeholders[3]	warehouse manager			
Stakeholders' assets, values[4]	reducing cost, reducing labor related problems (e.g. minimizing labors complaint), speed up of operation.			
System's threats and vulnerabilities[5]	possibility of back action			
Key performance indicators (KPIs)	ID	Name	Description	Reference to mentioned use case objectives
	1	Number of labors	reduced % of labors	improvement of productivity
	2	Number of complaints	reduced % of labor's complaint	improvement of productivity
	3	Lead time	time from order to shipment	improvement of productivity
AI features	Task(s)	Optimization		
	Method(s)[6]	modeling of relationship between explaining variables and outcome, and optimization		
	Hardware[7]	PC, wearable sensor		
	Topology[8]			
	Terms and concepts used[9]	Human big data analysis, regression analysis		

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Standardization opportunities/ requirements	standardization of data format, sensors to be used, and API of IT and mechanical systems	
Challenges and issues	understanding of workers' human factors (privacy, additional work etc.)	
Societal concerns	Description	solving labor shortage problem and improving labor related issues with aiming improving productivity.
	SDGs[10]	Industry, Innovation, and Infrastructure

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Data (optional)

Data characteristics	
Description	
Source[11]	
Type[12]	
Volume (size)	
Velocity (e.g. real time)[13]	
Variety (multiple datasets)[14]	
Variability (rate of change)[15]	
Quality[16]	

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Process scenario (optional)

Scenario conditions					
No.	Scenario name	Scenario description	Triggering event	Pre-condition[17]	Post-condition[18]

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Training (optional)

Scenario name	Training				
Step No.	Event[19]	Name of process/Activity[20]	Primary actor	Description of process/activity	Requirement

Specification of training data[21]	

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Evaluation (optional)

Scenario name	Evaluation				
Step No.	Event[22]	Name of process/Activity[23]	Primary actor	Description of process/activity	Requirement

Input of evaluation[24]	
Output of evaluation[25]	

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Execution (optional)

Scenario name	Execution				
Step No.	Event[26]	Name of process/Activity[27]	Primary actor	Description of process/activity	Requirement

Input of Execution[28]	
Output of Execution[29]	

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Retraining (optional)

Scenario name	Retraining				
Step No.	Event[30]	Name of process/Activity[31]	Primary actor	Description of process/activity	Requirement

Specification of retraining data[32]	

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References

References						
No.	Type	Reference	Status	Impact on use case	Originator/organization	Link
1	company's technical journal		Published		Hitachi, Ltd.,	http://www.hitachi.com/rev/archive/2016/r2016_06/106/index.html

[1] F. Kudo T. Akitomi and N. Moriwaki, "An Artificial Intelligence Computer System for Analysis of Social Infrastructure Data," IEEE conf. Business Infomatics (CBI), 2015.

[2] J. Kimura et al., "Framework for Collaborative Creation with Customers to Improve Warehouse Logistics," Hitachi Review, 65, pp. 873-877, 2016.

[3] Hitachi News Release, "Development of Artificial Intelligence issuing work orders based on understanding of on-site Kaizen activity and demand fluctuation," 2015. http://www.hitachi.com/New/cnews/month/2015/09/150904.html

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Footnote

[1] Leave this cell blank.

[2] The scope defines the limits of the use case.

[3] Stakeholder involved in the scenario - examples are: type of organization; customers, 3rd parties; end users; humans; environment; negative stakeholders (attackers, criminals, etc).

[4] Assets and values that are valuable to the stakeholders and at the risk of being compromised by the AI system deployment – examples can include competitiveness; reputation or trust; fairness; safety; privacy; stability; etc.

[5] Threats and vulnerabilities can compromise the assets and values above. Examples are: different sources of bias; incorrect AI system use; new security threats; challenges to accountability; new privacy threats (hidden patterns).

[6] AI method(s)/framework(s) used.

[7] Hardware system used.

[8] Topology is the study of geometric forms differentiated by intersection and bifurcation. The term is used for the graphic aspects network architectures.

[9] Terms and concepts listed here can be used to extend the work of WG 1 (AWI 22989 and AWI 23053) as necessary.

[10] The Sustainable Development Goals (SDGs), otherwise known as the Global Goals, are a collection of 17 global goals set by the United Nations General Assembly. SDGs are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity.
See URL for more details: http://www.undp.org/content/undp/en/home/sustainable-development-goals.html

[11] Origin of data, which could be from instruments, IoT, web, surveys, commercial activity, or from simulations.

[12] Structured/unstructured Images, voices, text, gene sequences, and numerical. Composite: time-series, graph-structured

[13] The rate of flow at which the data is created, stored, analysed, or visualized.

[14] Data from a number of domains and a number of data types. The wider range of data formats, logical models, timescales, and semantics complicates the integration of the variety of data.

[15] Changes in data rate, format/structure, semantics, and/or quality.

[16] Completeness and accuracy of the data with respect to semantic content as well as syntactical of the data (such as presence of missing fields or incorrect values)

[17] Describe which condition(s) should have been met before this scenario happens.

[18] Describe which condition(s) should prevail after this scenario happens. The post-condition may also define "success" or "failure" conditions.

[19] The event that triggers the step. This might be completion of the previous event.

[20] Action verbs should be used when naming activity.

[21] Training data can be further specified.

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[22] The event that triggers the step. This might be completion of the previous event.

[23] Action verbs should be used when naming activity.

[24] Specify input of evaluation.

[25] Specify output of evaluation.

[26] The event that triggers the step. This might be completion of the previous event.

[27] Action verbs should be used when naming activity.

[28] Specify input of evaluation.

[29] Specify output of evaluation.

[30] The event that triggers the step. This might be completion of the previous event.

[31] Action verbs should be used when naming activity.

[32] Retraining data can be further specified.

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