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| ITU Logo | INTERNATIONAL TELECOMMUNICATION UNION  **TELECOMMUNICATION STANDARDIZATION SECTOR**  STUDY PERIOD 2017-2020 | | | FG-AI4H-LS-002 |
| **ITU-T Focus Group on AI for Health** |
| **English only** |
| **WG(s):** | | N/A | |  |
| **LIAISON STATEMENT** | | | | |
| **Source:** | | FG-AI4H | | |
| **Title:** | | LS/r on request for relevant AI Use Cases ([ISO/IEC JTC1/SC42-20190531](http://ifa.itu.int/t/2017/ls/isoiecjtc1sc42/sp16-iso_iecjtc1_sc42-iLS-00003r1.zip)) | | |
| **Purpose:** | | Action | | |
| **LIAISON STATEMENT** | | | | |
| **For action to:** | | | ISO/IEC JTC1 SC42 WG4 | |
| **For comment to:** | | | **‑** | |
| **For information to:** | | | ITU-T SG16 | |
| **Approval:** | | | FG-AI4H meeting (Zanzibar, 5 September 2019) | |
| **Deadline:** | | | 1 November 2019 | |
| **Contact:** | | Thomas Wiegand Chair, FG-AI4H HHI Fraunhofer, Germany | | E-mail: [thomas.wiegand@hhi.fraunhofer.de](mailto:thomas.wiegand@hhi.fraunhofer.de) |
| **Contact:** | | Pat Baird Chair, FG-AI4H WG-DAISAM Philips | | E-mail: [pat.baird@Philips.com](mailto:pat.baird@Philips.com) |

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| **Abstract:** | This reply LS provides two general use cases under consideration by the FG-AI4H to JTC 1/SC42 "Artificial Intelligence" WG4 for inclusion technical report it is preparing. |

ITU-T Focus Group on AI for health thanks JTC 1/SC 42 "Artificial Intelligence" for its LS on (our FG-AI4H-F-019, your [ISO/IEC JTC1/SC42-20190531](http://ifa.itu.int/t/2017/ls/isoiecjtc1sc42/sp16-iso_iecjtc1_sc42-iLS-00003r1.zip)). We would like to offer two use cases that are an abstraction of use cases being considered by FG-AI4H (see list at <https://itu.nt/go/fgai4h>), as found annexed to this reply.

ITU-T FG-AI4H looks forward to continued collaboration with SC42.

ANNEX A ISO/IEC JTC 1 SC 42 Artificial Intelligence – Working Group 4 Use Case Submission Form - Symptom Assessment 2

ANNEX B ISO/IEC JTC 1 SC 42 Artificial Intelligence – Working Group 4 Use Case Submission Form - Outbreak Detection 12

# ANNEX A ISO/IEC JTC 1 SC 42 Artificial Intelligence – Working Group 4 Use Case Submission Form - Symptom Assessment

The quality of use case submissions will be evaluated for inclusion in the Working Group’s Technical Report based the application area, relevant AI technologies, credible reference sources (see References section), and the following characteristics:

* Data Focus & Learning: Use cases for AI system which utilizes Machine Learning, and those that use a fixed *a priori* knowledge base.
* Level of Autonomy: Use cases demonstrating several degrees (dependent, autonomous, human/critic in the loop, etc.) of AI system autonomy.
* Verifiability & Transparency: Use cases demonstrating several types and levels of verifiability and transparency, including approaches for explainable AI, accountability, etc.
* Impact: Use cases demonstrating the impact of AI systems to society, environment, etc.
* Architecture: Use cases demonstrating several architectural paradigms for AI systems (e.g., cloud, distributed AI, crowdsourcing, swarm intelligence, etc.)

1. **General**

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| --- | --- | --- | --- | --- |
| ID | (leave blank, for internal use) | | | |
| Use case name | Symptom Assessment (hypothetical) | | | |
| Application domain | Healthcare | | | |
| Deployment  model | Mobile applications accessing AI backends running on a cloud platform. Stand alone offline mobile applications. | | | |
| Status | Multiple products available. | | | |
| Scope[[1]](#footnote-1) | General humans (patients), health workers and health professionals. | | | |
| Objective(s)[[2]](#footnote-2) | Support patients and doctors with (pre)-diagnosing health problems and providing advice on next steps. | | | |
| Narrative | Short description (not more than 150 words) | As people are living longer and as the population is growing, there is a global shortage of caregivers. This shortage varies by region. One way to more efficiently use caregivers is to have patients use symptom assessment software that can provide them with a first assessment that informs their next steps. | | |
| Complete description | The World Health Organization estimates the shortage of global health workers to increase from 7.2 million in 2013 to 12.9 million by 2035. This shortage is driven by several factors including growing population, increasing life expectancy and higher health demands. The *2017 Global Monitoring Report* by the WHO and the World Bank reported that half of the world’s population lacks access to basic essential health services. The growing shortage of health workers is likely to further limit access to proper health care, reduce doctor time, and worsen patient journeys to a correct diagnosis and proper treatment.  While the problem in low and middle income countries (LMIC) is worse, in more developed countries health systems face challenges such as increased demand due to increased life expectancy. Additionally, available doctors have to spend considerable amounts of time on patients that do not always need to see a doctor. Up to 90% of people who seek help from primary care have only minor ailments and injuries. The vast majority (>75%) attend primary care because they lack an understanding of the risks they face or the knowledge to care for themselves. In the United Kingdom alone, there are 340 million consultations at the GP every year and the current system is being pushed to do more with less resources.  The gold standard for correct differential diagnosis, next step advice and adequate treatment is the evaluation of a medical doctor who is an expert in the respective medical field, which is based on many years of university education and structured training in hospitals. Depending on context, steps such as triage preceding diagnosis are responsibilities of other health workers. Decision making is often supported by clinical guidelines and protocols or by consulting literature, the internet or other experts.  In recent years, one promising approach to meet the challenging shortage of doctors has been the introduction of AI-based symptom assessment applications that have become widely available. This new class of system provides both consumers and doctors with actionable advice based on symptom constellations, findings and additional contextual information like age, sex and other risk factors. Starting from some general background information about the patient, these systems allow to enter the most relevant presenting complaints. After his step systems proactively collect further relevant evidence - usually in the form of a dialog inspired by the patient-doctor conversation. In a final step these systems provide some general pre-clinical triage (e.g. to see a doctor at the same day or to try self-care). Most systems also provide the list for most reasonable underlying diseases. | | |
| Stakeholders[[3]](#footnote-3) | patients, health workers, health professionals (doctors), clinics/hospitals, health systems, large companies, governments, health related NGOs, WHO, companies developing symptom assessment systems | | | |
| Stakeholders’ assets, values[[4]](#footnote-4) | personal/patient health, cost for diagnosis, cost for treatment, time to diagnosis, time to treatment, recovery time | | | |
| System’s threats & vulnerabilities[[5]](#footnote-5) | incorrect (pre)-diagnosis, incorrect triage, insufficient robustness against missing, incorrect or contradicting evidence, insufficient consideration of patient context (age, sex, region, season, ethnicity, etc.) | | | |
| Key performance indicators (KPIs) | ID | Name | Description | Reference to mentioned use case objectives |
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| AI features | Task(s) | Classification, interactive evidence gathering (chat bots) | | |
| Method(s)[[6]](#footnote-6) | Diverse; mostly data and/or knowledge driven probabilistic, heuristic or deductive expert systems; partially with conversational ML based NLP technology | | |
| Hardware[[7]](#footnote-7) | Diverse; generic cloud platform hardware | | |
| Topology[[8]](#footnote-8) | Diverse | | |
| Terms and concepts used[[9]](#footnote-9) |  | | |
| Standardization  opportunities/ requirements | * standardized quality benchmarking * standardization of input space (symptoms, findings, etc.) and output space (conditions, ICD10, pre-clinical triage levels etc.) | | | |
| Challenges and issues |  | | | |
| Societal  Concerns[[10]](#footnote-10) | Description |  | | |
| SDGs[[11]](#footnote-11) to be achieved | Good health and well-being for people | | |

**Data (optional)**

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| Data characteristics | |
| Description |  |
| Source[[12]](#footnote-12) |  |
| Type[[13]](#footnote-13) |  |
| Volume (size) |  |
| Velocity[[14]](#footnote-14) |  |
| Variety[[15]](#footnote-15) |  |
| Variability  (rate of change)[[16]](#footnote-16) |  |
| Quality[[17]](#footnote-17) |  |

**Process scenario (optional)**

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| Scenario conditions | | | | | |
| No. | Scenario name | Scenario description | Triggering event | Pre-condition[[18]](#footnote-18) | Post-condition[[19]](#footnote-19) |
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**Training (optional)**

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| Scenario name | Training | | | | |
| Step No. | Event[[20]](#footnote-20) | Name of process/Activity[[21]](#footnote-21) | Primary actor | Description of process/activity | Requirement |
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| Specification of training data | |  | | | |

**Evaluation (optional)**

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| Scenario name | Evaluation | | | | |
| Step No. | Event[[22]](#footnote-22) | Name of process/Activity[[23]](#footnote-23) | Primary actor | Description of process/activity | Requirement |
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| Input of evaluation | |  | | | |
| Output of evaluation | |  | | | |

**Execution (optional)**

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| Scenario name | Execution | | | | |
| Step No. | Event[[24]](#footnote-24) | Name of process/Activity[[25]](#footnote-25) | Primary actor | Description of process/activity | Requirement |
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| Input of Execution | |  | | | |
| Output of Execution | |  | | | |

**Retraining (optional)**

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| Scenario name | Retraining | | | | |
| Step No. | Event[[26]](#footnote-26) | Name of process/Activity[[27]](#footnote-27) | Primary actor | Description of process/activity | Requirement |
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| Specification of retraining data | |  | | | |

**References**

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| References | | | | | | |
| No. | Type | Reference | Status | Impact on use case | Originator/organization | Link |
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Acceptable Reference Sources of Use Cases

* Peer-reviewed scientific/technical publications on AI applications (e.g. [1]).
* Patent documents describing AI solutions (e.g. [2], [3]).
* Technical reports or presentations by renowned AI experts (e.g. [4])
* High quality company whitepapers and presentations
* Publicly accessible sources with sufficient detail

***This list is not exhaustive. Other credible sources may be acceptable as well.***

Examples of credible sources:

* [1] B. Du Boulay. "Artificial Intelligence as an Effective Classroom Assistant". IEEE Intelligent Systems, V 31, p.76–81. 2016.
* [2] S. Hong. "Artificial intelligence audio apparatus and operation method thereof". N US 9,948,764, Available at: [https://patents.google.com/patent/US20150120618A1/en. 2018](https://patents.google.com/patent/US20150120618A1/en.%202018).
* [3] M.R. Sumner, B.J. Newendorp and R.M. Orr. "Structured dictation using intelligent automated assistants". N US 9,865,280, 2018.
* [4] J. Hendler, S. Ellis, K. McGuire, N. Negedley, A. Weinstock, M. Klawonn and D. Burns. "WATSON@RPI, Technical Project Review".

URL: [https://www.slideshare.net/jahendler/watson-summer-review82013final. 2013](https://www.slideshare.net/jahendler/watson-summer-review82013final.%202013).

# ANNEX B ISO/IEC JTC 1 SC 42 Artificial Intelligence – Working Group 4 Use Case Submission Form - Outbreak Detection

The quality of use case submissions will be evaluated for inclusion in the Working Group’s Technical Report based the application area, relevant AI technologies, credible reference sources (see References section), and the following characteristics:

* Data Focus & Learning: Use cases for AI system which utilizes Machine Learning, and those that use a fixed *a priori* knowledge base.
* Level of Autonomy: Use cases demonstrating several degrees (dependent, autonomous, human/critic in the loop, etc.) of AI system autonomy.
* Verifiability & Transparency: Use cases demonstrating several types and levels of verifiability and transparency, including approaches for explainable AI, accountability, etc.
* Impact: Use cases demonstrating the impact of AI systems to society, environment, etc.
* Architecture: Use cases demonstrating several architectural paradigms for AI systems (e.g., cloud, distributed AI, crowdsourcing, swarm intelligence, etc.)

1. **General**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ID | (leave blank, for internal use) | | | |
| Use case name | Outbreak Detection (hypothetical) | | | |
| Application domain | Healthcare | | | |
| Deployment  model | Cloud services | | | |
| Status | Prototype | | | |
| Scope[[28]](#footnote-28) | Public health systems | | | |
| Objective(s)[[29]](#footnote-29) | Improve public health by early identification of disease outbreaks based on data collections to enable early interventions. | | | |
| Narrative | Short description (not more than 150 words) | Infectious disease outbreaks pose a major risk to public health; early detection of emerging infectious diseases can prompt fast interventions.   * Different potential data sources and surveillance systems can be used for the detection of outbreaks. These data streams serve as input for signal-detection algorithms * AI algorithms can be applied to detect aberrant case numbers based on these data collections * AI algorithms have the potential to increase the timeliness and accuracy of outbreak detection | | |
| Complete description |  | | |
| Stakeholders[[30]](#footnote-30) | Workers in public health systems (epidemiologists, staff in local and federal health agencies, etc) responsible for the process of outbreak investigations, politician, public | | | |
| Stakeholders’ assets, values[[31]](#footnote-31) |  | | | |
| System’s threats & vulnerabilities[[32]](#footnote-32) |  | | | |
| Key performance indicators (KPIs) | ID | Name | Description | Reference to mentioned use case objectives |
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| AI features | Task(s) | Prediction | | |
| Method(s)[[33]](#footnote-33) |  | | |
| Hardware[[34]](#footnote-34) |  | | |
| Topology[[35]](#footnote-35) |  | | |
| Terms and concepts used[[36]](#footnote-36) |  | | |
| Standardization  opportunities/ requirements |  | | | |
| Challenges and issues | Benchmarking challenges on data (label definition, label uncertainty issues, data diversity, generation of comprehensive (undisclosed) test data set, definition/development of epidemiologically relevant metrics for evaluation | | | |
| Societal  Concerns[[37]](#footnote-37) | Description |  | | |
| SDGs[[38]](#footnote-38) to be achieved | Good health and well-being for people | | |

**Data (optional)**

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| Data characteristics | |
| Description |  |
| Source[[39]](#footnote-39) |  |
| Type[[40]](#footnote-40) | (spatio)-temporal data |
| Volume (size) |  |
| Velocity[[41]](#footnote-41) |  |
| Variety[[42]](#footnote-42) |  |
| Variability  (rate of change)[[43]](#footnote-43) |  |
| Quality[[44]](#footnote-44) |  |

**Process scenario (optional)**

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| --- | --- | --- | --- | --- | --- |
| Scenario conditions | | | | | |
| No. | Scenario name | Scenario description | Triggering event | Pre-condition[[45]](#footnote-45) | Post-condition[[46]](#footnote-46) |
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**Training (optional)**

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| Scenario name | Training | | | | |
| Step No. | Event[[47]](#footnote-47) | Name of process/Activity[[48]](#footnote-48) | Primary actor | Description of process/activity | Requirement |
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| Specification of training data | |  | | | |

**Evaluation (optional)**

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| Scenario name | Evaluation | | | | |
| Step No. | Event[[49]](#footnote-49) | Name of process/Activity[[50]](#footnote-50) | Primary actor | Description of process/activity | Requirement |
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| Input of evaluation | |  | | | |
| Output of evaluation | |  | | | |

**Execution (optional)**

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| Scenario name | Execution | | | | |
| Step No. | Event[[51]](#footnote-51) | Name of process/Activity[[52]](#footnote-52) | Primary actor | Description of process/activity | Requirement |
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| Input of Execution | |  | | | |
| Output of Execution | |  | | | |

**Retraining (optional)**

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| Scenario name | Retraining | | | | |
| Step No. | Event[[53]](#footnote-53) | Name of process/Activity[[54]](#footnote-54) | Primary actor | Description of process/activity | Requirement |
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| Specification of retraining data | |  | | | |

**References**

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| References | | | | | | |
| No. | Type | Reference | Status | Impact on use case | Originator/organization | Link |
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Acceptable Reference Sources of Use Cases

* Peer-reviewed scientific/technical publications on AI applications (e.g. [1]).
* Patent documents describing AI solutions (e.g. [2], [3]).
* Technical reports or presentations by renowned AI experts (e.g. [4])
* High quality company whitepapers and presentations
* Publicly accessible sources with sufficient detail

***This list is not exhaustive. Other credible sources may be acceptable as well.***

Examples of credible sources:

* [1] B. Du Boulay. "Artificial Intelligence as an Effective Classroom Assistant". IEEE Intelligent Systems, V 31, p.76–81. 2016.
* [2] S. Hong. "Artificial intelligence audio apparatus and operation method thereof". N US 9,948,764, Available at: [https://patents.google.com/patent/US20150120618A1/en. 2018](https://patents.google.com/patent/US20150120618A1/en.%202018).
* [3] M.R. Sumner, B.J. Newendorp and R.M. Orr. "Structured dictation using intelligent automated assistants". N US 9,865,280, 2018.
* [4] J. Hendler, S. Ellis, K. McGuire, N. Negedley, A. Weinstock, M. Klawonn and D. Burns. "WATSON@RPI, Technical Project Review".

URL: [https://www.slideshare.net/jahendler/watson-summer-review82013final. 2013](https://www.slideshare.net/jahendler/watson-summer-review82013final.%202013).

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1. The scope defines the intended area of applicability, limits, and audience. [↑](#footnote-ref-1)
2. The intention of the system; what is to be accomplished?; who/what will benefit?. [↑](#footnote-ref-2)
3. Stakeholder are those that can affect or be affected by the AI system in the scenario; e.g., organizations, customers, 3rd parties, end users, community, environment, negative influencers, bad actors, etc. [↑](#footnote-ref-3)
4. Stakeholders’ assets and values that are at stake with potential risk of being compromised by the AI system deployment – e.g., competitiveness, reputation, trustworthiness, fair treatment, safety, privacy, stability, etc. [↑](#footnote-ref-4)
5. Threats and vulnerabilities can compromise the assets and values above - e.g., different sources of bias, incorrect AI system use, new security threats, challenges to accountability, new privacy threats (hidden patterns), etc. [↑](#footnote-ref-5)
6. AI method(s)/framework(s) used in development. [↑](#footnote-ref-6)
7. Hardware system used in development and deployment. [↑](#footnote-ref-7)
8. Topology of the deployment network architecture. [↑](#footnote-ref-8)
9. Terms and concepts used here should be consistent with those defined by Working Group 1 (AWI 22989 and AWI 23053) or to be recommended for inclusion. [↑](#footnote-ref-9)
10. To be inserted. [↑](#footnote-ref-10)
11. The Sustainable Development Goals (SDGs), also 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.

    URL: <http://www.undp.org/content/undp/en/home/sustainable-development-goals.html> [↑](#footnote-ref-11)
12. Origin of data, which could be from customers, instruments, IoT, web, surveys, commercial activity, simulations, etc. [↑](#footnote-ref-12)
13. Structured/unstructured text, images, voices, gene sequences, numbers, composite: time-series, graph-structures, etc. [↑](#footnote-ref-13)
14. The rate of flow at which the data is created, stored, analysed, or visualized. Could be in real time. [↑](#footnote-ref-14)
15. Domains and types of data employed including formats, logical models, timescales, and semantics. Could be from multiple databases. [↑](#footnote-ref-15)
16. Changes in data rate, format/structure, semantics, and/or quality. [↑](#footnote-ref-16)
17. Completeness and accuracy of the data with respect to semantic content as well as syntax of the data (such as presence of missing fields or incorrect values). [↑](#footnote-ref-17)
18. Describes which condition(s) should have been met before this scenario happens. [↑](#footnote-ref-18)
19. Describes which condition(s) should prevail after this scenario happens. The post-condition may also define "success" or "failure" conditions [↑](#footnote-ref-19)
20. The event that triggers the step. This might be completion of the previous event. [↑](#footnote-ref-20)
21. Action verbs should be used when naming activity. [↑](#footnote-ref-21)
22. The event that triggers the step. This might be completion of the previous event. [↑](#footnote-ref-22)
23. Action verbs should be used when naming activity. [↑](#footnote-ref-23)
24. The event that triggers the step. This might be completion of the previous event. [↑](#footnote-ref-24)
25. Action verbs should be used when naming activity. [↑](#footnote-ref-25)
26. The event that triggers the step. This might be completion of the previous event. [↑](#footnote-ref-26)
27. Action verbs should be used when naming activity. [↑](#footnote-ref-27)
28. The scope defines the intended area of applicability, limits, and audience. [↑](#footnote-ref-28)
29. The intention of the system; what is to be accomplished?; who/what will benefit?. [↑](#footnote-ref-29)
30. Stakeholder are those that can affect or be affected by the AI system in the scenario; e.g., organizations, customers, 3rd parties, end users, community, environment, negative influencers, bad actors, etc. [↑](#footnote-ref-30)
31. Stakeholders’ assets and values that are at stake with potential risk of being compromised by the AI system deployment – e.g., competitiveness, reputation, trustworthiness, fair treatment, safety, privacy, stability, etc. [↑](#footnote-ref-31)
32. Threats and vulnerabilities can compromise the assets and values above - e.g., different sources of bias, incorrect AI system use, new security threats, challenges to accountability, new privacy threats (hidden patterns), etc. [↑](#footnote-ref-32)
33. AI method(s)/framework(s) used in development. [↑](#footnote-ref-33)
34. Hardware system used in development and deployment. [↑](#footnote-ref-34)
35. Topology of the deployment network architecture. [↑](#footnote-ref-35)
36. Terms and concepts used here should be consistent with those defined by Working Group 1 (AWI 22989 and AWI 23053) or to be recommended for inclusion. [↑](#footnote-ref-36)
37. To be inserted. [↑](#footnote-ref-37)
38. The Sustainable Development Goals (SDGs), also 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.

    URL: <http://www.undp.org/content/undp/en/home/sustainable-development-goals.html> [↑](#footnote-ref-38)
39. Origin of data, which could be from customers, instruments, IoT, web, surveys, commercial activity, simulations, etc. [↑](#footnote-ref-39)
40. Structured/unstructured text, images, voices, gene sequences, numbers, composite: time-series, graph-structures, etc. [↑](#footnote-ref-40)
41. The rate of flow at which the data is created, stored, analysed, or visualized. Could be in real time. [↑](#footnote-ref-41)
42. Domains and types of data employed including formats, logical models, timescales, and semantics. Could be from multiple databases. [↑](#footnote-ref-42)
43. Changes in data rate, format/structure, semantics, and/or quality. [↑](#footnote-ref-43)
44. Completeness and accuracy of the data with respect to semantic content as well as syntax of the data (such as presence of missing fields or incorrect values). [↑](#footnote-ref-44)
45. Describes which condition(s) should have been met before this scenario happens. [↑](#footnote-ref-45)
46. Describes which condition(s) should prevail after this scenario happens. The post-condition may also define "success" or "failure" conditions [↑](#footnote-ref-46)
47. The event that triggers the step. This might be completion of the previous event. [↑](#footnote-ref-47)
48. Action verbs should be used when naming activity. [↑](#footnote-ref-48)
49. The event that triggers the step. This might be completion of the previous event. [↑](#footnote-ref-49)
50. Action verbs should be used when naming activity. [↑](#footnote-ref-50)
51. The event that triggers the step. This might be completion of the previous event. [↑](#footnote-ref-51)
52. Action verbs should be used when naming activity. [↑](#footnote-ref-52)
53. The event that triggers the step. This might be completion of the previous event. [↑](#footnote-ref-53)
54. Action verbs should be used when naming activity. [↑](#footnote-ref-54)