

# Human-Machine Network Characterisation

Imagine a network of people and technology, like sensors, mobile phones, laptops, tablets and servers, etc. Together, they engage in a common activity, like socialising via social networks, sharing knowledge via platforms like Wikipedia or Zooniverse, providing decision support for crisis management, online shopping or banking, education, and eHealth. There are many, many examples. Let's collectively call them Human-Machine Networks (HMNs). There's an illustrative example above, showing a network comprising various agents, both humans and machines (operations system and sensors), interacting with one another.

In the EC H2020 HUMANE project, we are creating a typology that can be used to characterise and analyse HMNs, to aid the system design process. The current typology comprises 8 dimensions that reflect aspects of a HMN such as the network size and interaction between humans and machines. Any feedback you can provide via this survey will be used to help improve this typology.

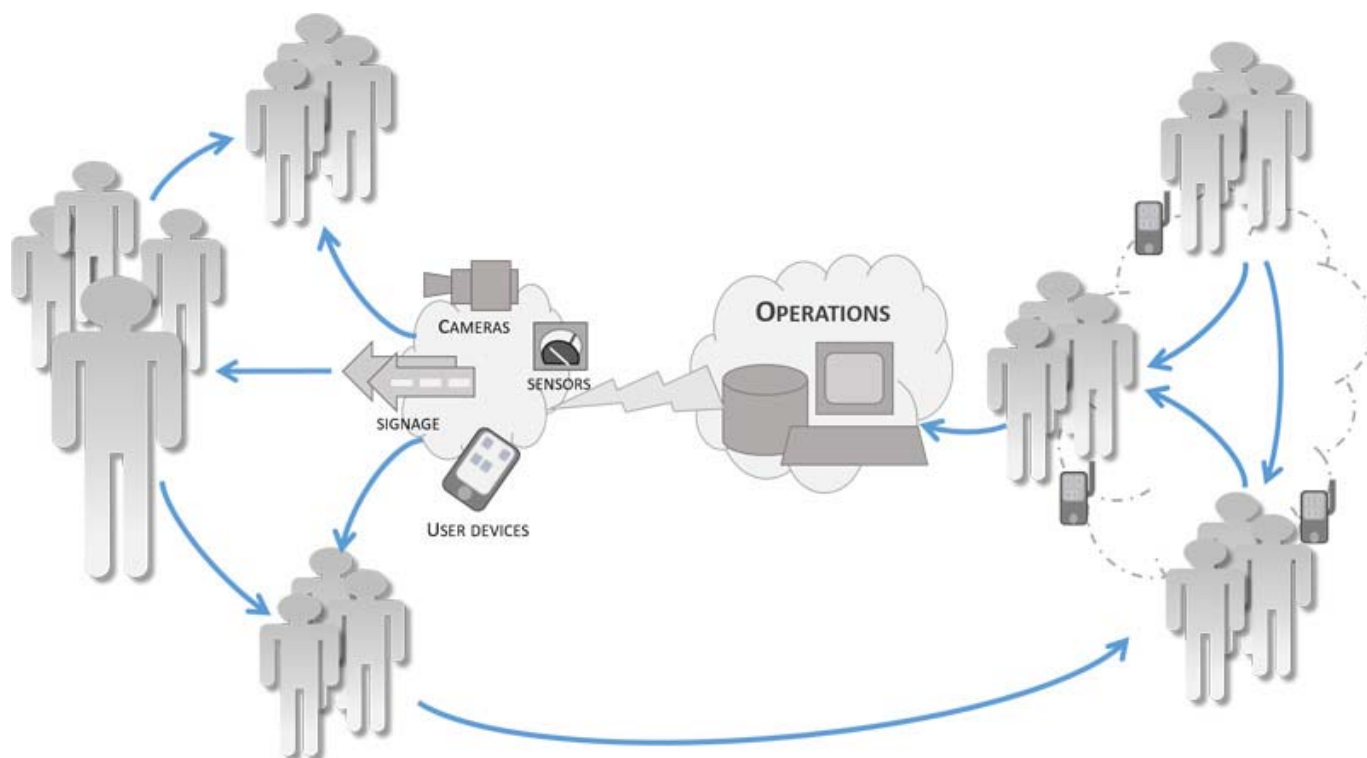
This survey contains a set of statements about any HMN - which may be one you're familiar with and use yourself, or maybe one that you're working on at the moment. What you need to do is read each statement in this questionnaire, and tells us how much that statement applies to the network you're thinking of. You'll be able to select "Strongly Disagree, Disagree, Agree, Strongly Agree" in each case.

The survey shouldn't take you more than 10-15 minutes to complete. We won't collect any personal information about you: it is entirely anonymous. Because of that, once you hit "Submit" at the end, you will not be able to withdraw or change any of your answers. Your responses will be used for scientific research purposes only as part of the HUMANE project. If you have any questions, please contact: Vegard Engen ([ve@it-innovation.soton.ac.uk](mailto:ve@it-innovation.soton.ac.uk)).

Thank you for taking part.

This study has been approved by the Faculty of Physical Science and Engineering, University of Southampton (ERGO Ref: 23350)

NOTE: by agreeing to take part in this survey, you confirm that you are 18 years of age or older.



## Section 1. General

Before you start, can we please ask a few things about you and the network you will base your answers on?

### Question 1.1

Please tell us the Human-Machine Network (HMN) you will have in mind when filling in this questionnaire.

Or tell us the project it was used in or was developed by.

Or just describe what the HMN does.

### Question 1.2

In your job, please tick all that apply.

- ☐ I am a user of one or more HMNs
- ☐ I represent users of one or more HMNs
- ☐ I design user interfaces
- ☐ I'm concerned with human-machine interactions
- ☐ I'm concerned with machine-to-machine interactions
- ☐ I am concerned with architecture design
- ☐ I implement software
- ☐ Other

## Section 2. Actors

In HUMANE, we consider HMNs to be comprised of two kinds of actor: humans and machines. The latter representing, e.g., platforms, specific software components, hardware, sensors, robots, etc. Both human and machine actors are seen as having agency in the network.

### Question 2.1

**Human agency:** The capacity of human actors in terms of what they can do and achieve in the network.

- |   |                       |                       |                       |                       |
|---|-----------------------|-----------------------|-----------------------|-----------------------|
| People can perform a diverse range of activities in the HMN   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| People are able to interact freely and influence other participants in the HMN, whether human or machine  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| The activities people can perform allow them to express their personalities, behave diversely, freely, creatively and even use the HMN unpredictably                  | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| People can use the HMN to help them achieve goals (set by themselves) that they may otherwise not be able to achieve, e.g., via other people or technology in the HMN | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

### Question 2.2

**Machine agency:** The capacity of machine actors in terms of what they can do in the network, as well as the extent they enable agency in human actors (allowing them to do things they wouldn't be able to do on their own).

- |   |                       |                       |                       |                       |
|---|-----------------------|-----------------------|-----------------------|-----------------------|
| Machines (technological actors/agents) in the HMN can perform a diverse range of activities   | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Machines can interact freely with - and may influence other participants in the HMN, and may help human agents achieving goals they cannot achieve on their own | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| The activities the machine agents can perform are open, giving opportunity for dynamic and perhaps unpredictable behaviour                                      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| The behaviour of the machines in the HMN can be seen as intelligent and autonomous, with human-like appearance or behaviour                                     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

## Question 2.3

Any feedback on these two dimensions? Were the questions understandable?

## Section 3. Interactions

In HUMANE, we are interested in the relationships between the human and machine nodes of the HMN, which tells us something about how they interact and behave.

## Question 3.1

**Social tie strength:** The "strength" between the human nodes of the network, e.g., whether they are intimate, lasting, and reciprocal.

People in the network are typically connected to one another by friendship or other close affiliation

☐ ☐ ☐ ☐

Relationships between people in the HMN typically last a long time

☐ ☐ ☐ ☐

People in the HMN are typically mutually supportive

☐ ☐ ☐ ☐

## Question 3.2

**Human-to-machine (H2M) interaction strength:** concerns the nature and strength of the interaction between humans and machines in the HMN; that is, the degree to which the relationship are characterised by trust, dependency and reliance.

People strongly trust the machines in the HMN

☐ ☐ ☐ ☐

People tend to accept what the machines of the HMN do and would only rarely intervene

☐ ☐ ☐ ☐

People depend on the machines in the HMN to achieve their goals (i.e., they have no alternatives if the machines fail)

☐ ☐ ☐ ☐

## Question 3.3

Any feedback on these two dimensions? Were the questions understandable?

## Section 4. Network

This layer concerns the size and geographical reach of the HMN. These dimensions in part address the potential for network effects in the HMN, as well as potential opportunities and challenges implied by a diversified group of human actors.

## Question 4.1

**Network size:** The number of human nodes in the HMN, as well as the uptake and growth of the network.

The HMN includes a broad range of users

☐ ☐ ☐ ☐

The HMN includes a large number of users

☐ ☐ ☐ ☐

The HMN has grown, or is expected to grow very rapidly

☐ ☐ ☐ ☐

## Question 4.2

**Geographical space:** Concerns the geographical extension of the HMN, including the degree to which the HMN is characterised by transnationality and cultural diversity.

The HMN includes members and sites in many countries or states

☐ ☐ ☐ ☐

The HMN includes members or sites across different cultural groups

☐ ☐ ☐ ☐

The HMN spans large geographical areas

☐ ☐ ☐ ☐

### Question 4.3

Any feedback on these two dimensions? Were the questions understandable?

## Section 5. Behaviour

Network behaviour concerns the characteristics of the HMN thought to be decisive for the network's capacity for improvement, adaptation and change. In particular, we consider the typical workflows of the HMN as well as how it's organised.

### Question 5.1

**Workflow interdependence:** Concerns the level of mutual dependency between the actors of the HMN (both human and machine). In particular, the degree to which the HMN activity requires coordination or collaboration, and whether the actions of one actor depend on the actions of others.

Activity in the HMN requires that people interact in a highly coordinated manner ☐ ☐ ☐ ☐

The actions and communication between people in the HMN very much depend on the actions and communications of others ☐ ☐ ☐ ☐

There is extensive collaboration between the people in the HMN ☐ ☐ ☐ ☐

### Question 5.2

**Network organisation:** Concerns the structure of how the network is organised, which has implications for predictability and emergent behaviour (top-down vs bottom-up).

The organisation of the HMN is highly centralised or predetermined ☐ ☐ ☐ ☐

The HMN has a stable organisation that does not easily adapt to different conditions ☐ ☐ ☐ ☐

The HMN is regulated by thorough and detailed policies ☐ ☐ ☐ ☐

### Question 5.3

Any feedback on these two dimensions? Were the questions understandable?

## Section 6. Feedback

Before you go, we would love any feedback you may have!

### Question 6.1

Do you consider all the dimensions to be relevant to the HMN you had in mind?

*The dimensions were: human and machine agency, social tie strength, human-machine interaction strength, network size, geographical space, workflow interdependence and network organisation.*

☐ Yes

☐ No

### Question 6.2

Do you think there are some dimensions missing? If so, please use the comment box below to provide further details.

☐ Yes

☐ No

Question 6.3

Any comments you wish to make, please add them here and you're done!

Thank you for taking this questionnaire.

To find out more about HUMANE, please have a look at our website: <https://humane2020.eu/>