

# Initiation: Scoping the Problem

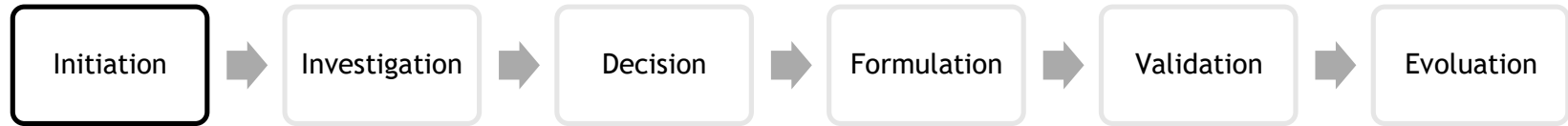
Emmanuel Letier

# Outline

1. The initiation phase: overview
2. Setting the project scope
3. Identifying stakeholders
4. Defining the project goals
5. Identifying constraints and risks
6. Developing a project glossary
7. Summary

# 1. The Initiation Phase: Overview

## The Initiation Phase (“project initiation”)



Short burst of activity at the start of a project to define its **vision** and check the project is **viable**.

- Can take a few hours to several days.
- Important because sets direction for whole project.
- Best to find out early if project is not viable.

## Deliverables

---

Project purpose	Short quantified statement of what the product is intended to do and what advantages it brings to its stakeholders.
Project scope	The part of the world that needs to be assisted or improved by the project.
Stakeholders	List of people interested in, or affected by the product.

---

### Additional deliverables

---

Constraints	Implementation, budget and schedule constraints.
Risks	What could go wrong and how to mitigate it.
Glossary	Names and definitions for key concepts in the world.
Go/no go decision	Is the project viable and worthwhile?

---

## 2. Setting the Project Scope

# The World and the Machine

The **Machine** is the product to be developed or improved.

Synonyms: the product, the software-to-be, the system-to-be, etc.

We create tangible machines that have physical effects on the world.

The **World** is the part of the real-world affected by the machine.

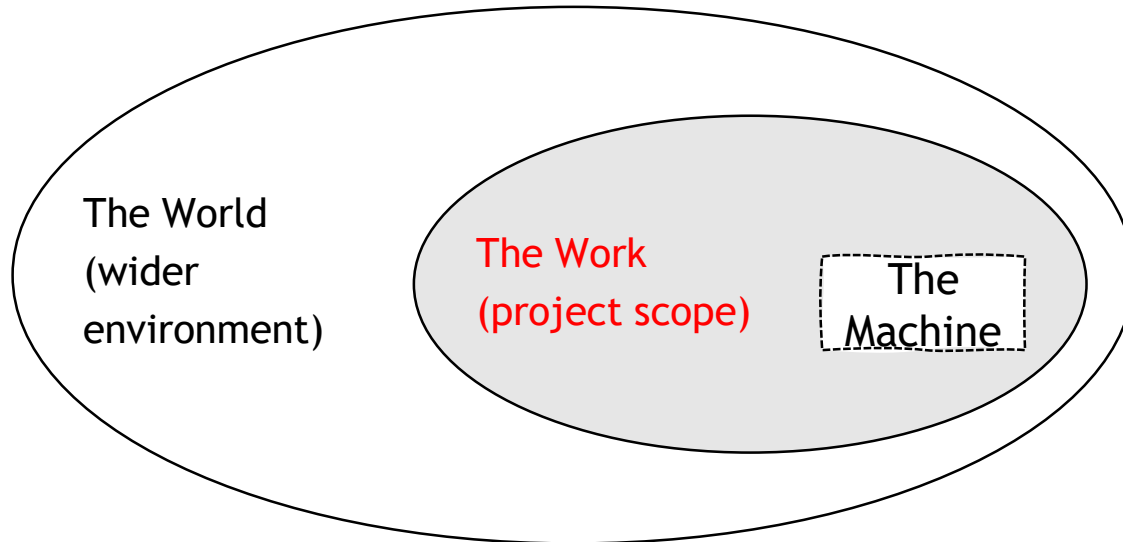
Synonyms: the application domain, the environment, the context.

The World is the scope of our requirements investigations.

# The Work

The **Work** is the part of the real-world to be supported and improved by the project or product development.

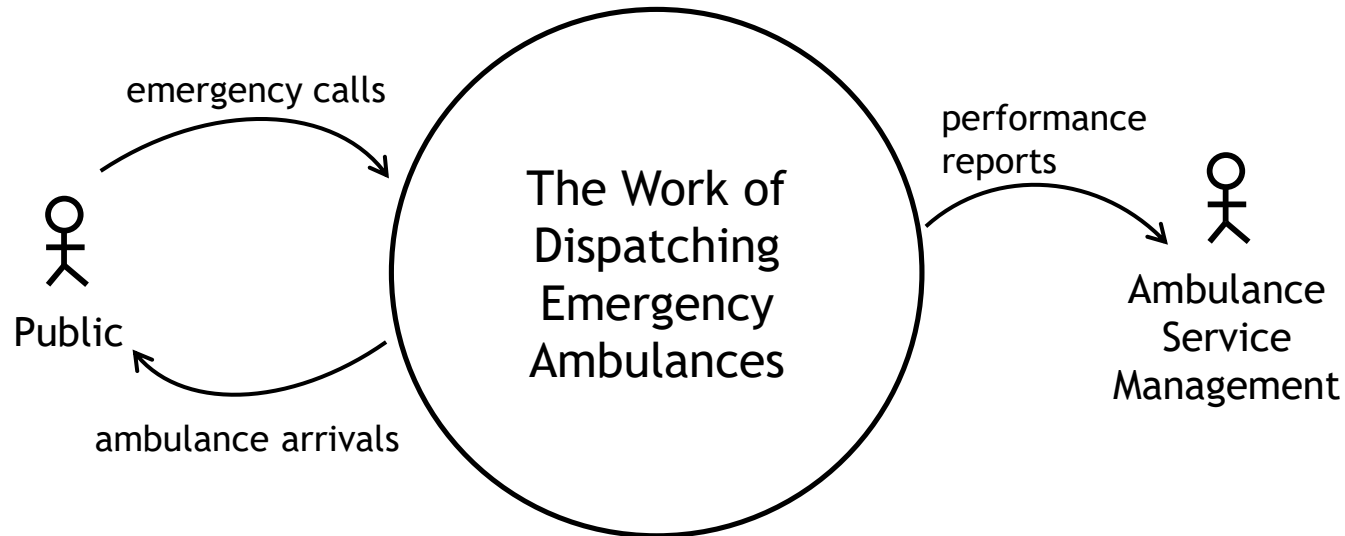
**Synonyms:** the project scope, the problem scope.





# Work Context Diagram (aka. project-level context diagram)

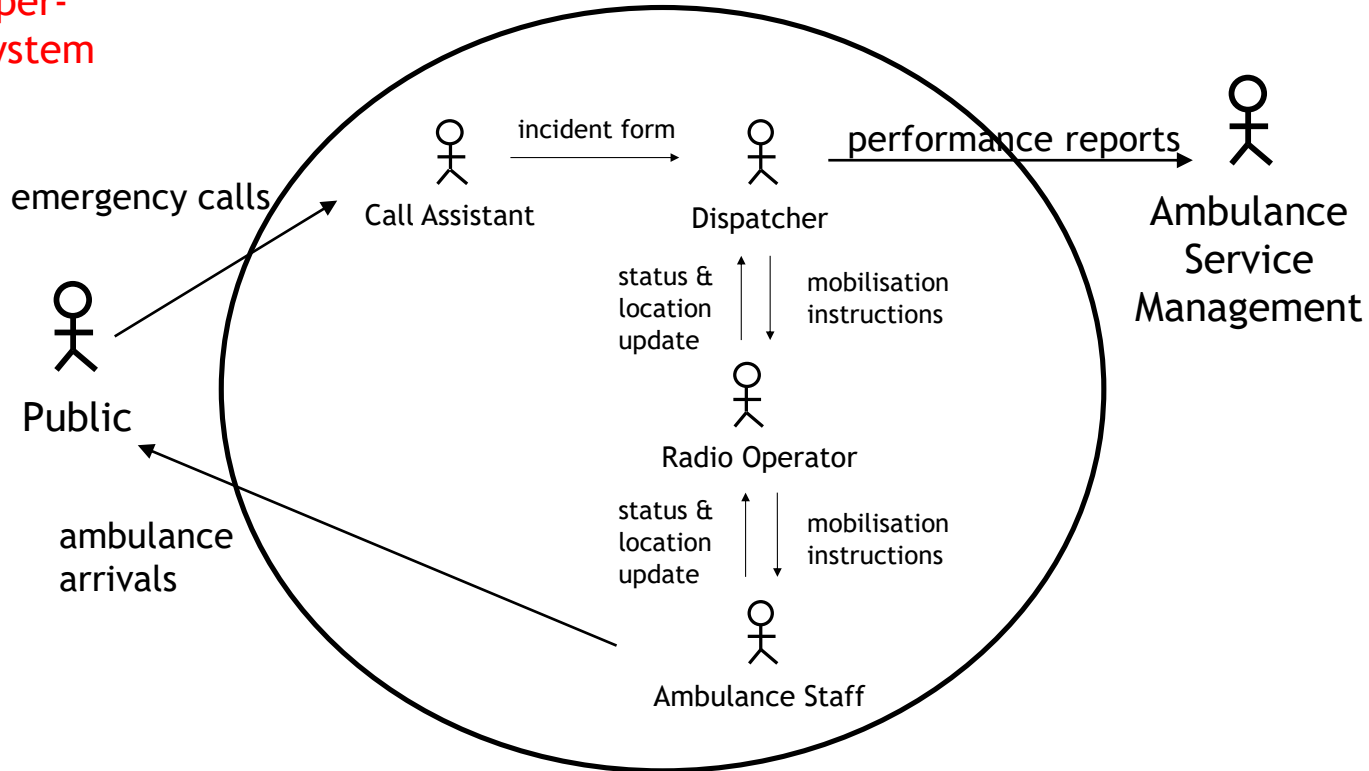
Think of the Work as a system that receives **inputs** and generate **outputs** from and to **adjacent systems**.



When setting the scope, we intentionally **ignore what happens inside the Work area**. We ignore whether we are describing the World as-is or to-be.

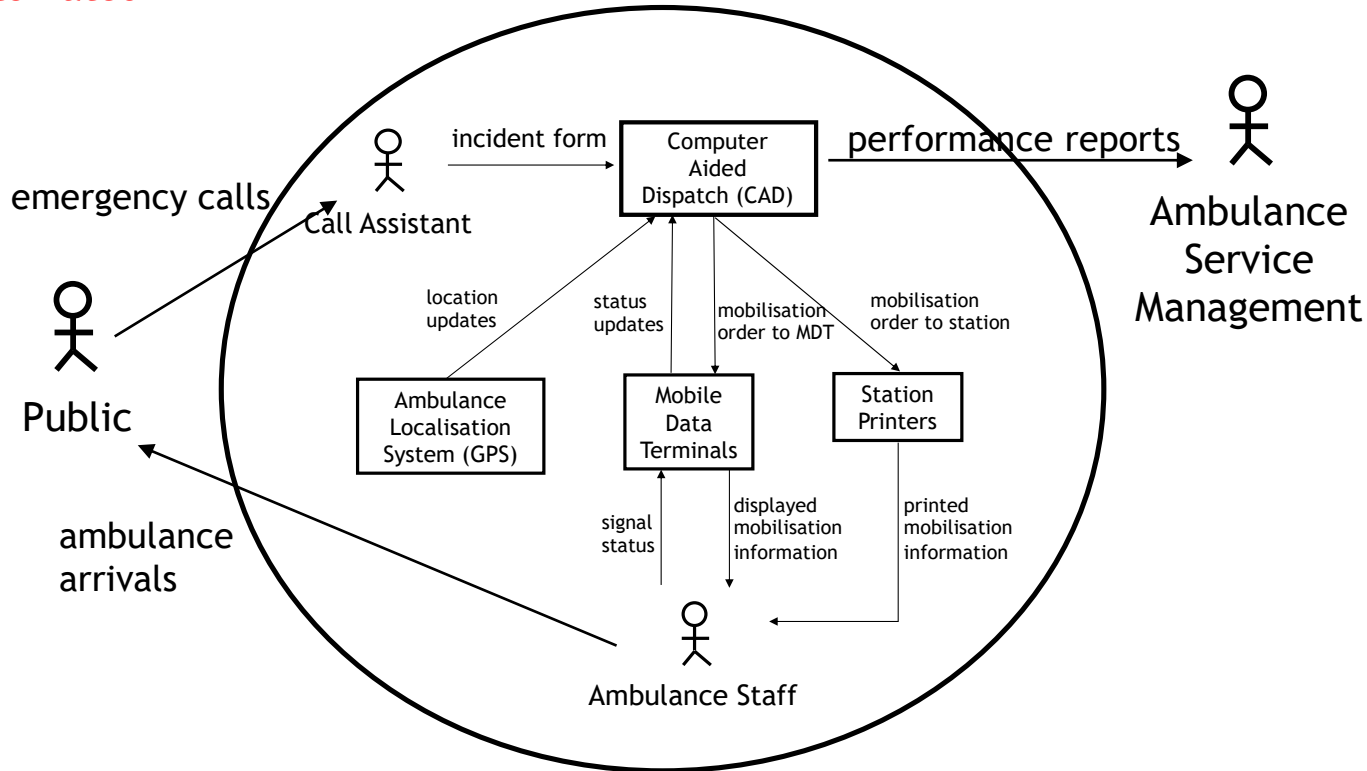
# Inside the Project Scope: The World-as-is

1992 Paper-based system



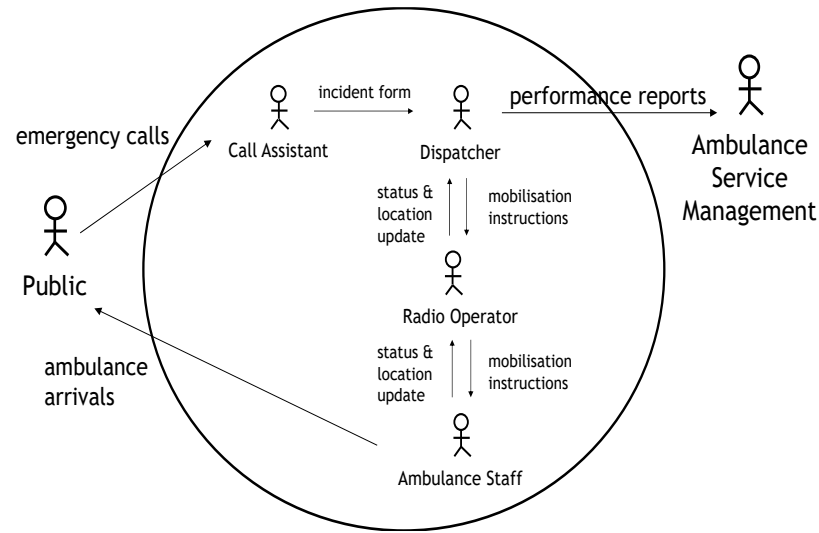
# Inside the Project Scope: The World-to-be

## 1993 Automated System

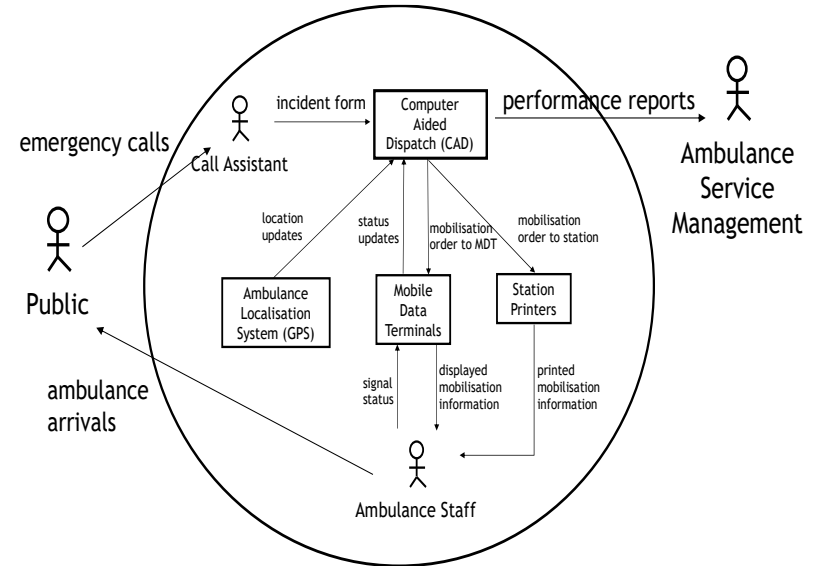


# The Work context has not changed; only the inside has changed!

## Before (paper-based system)



## After (automated system)



## How to set the project scope

1. Identify the real-world activities the machine must support or improve.
  - E.g. Dispatching ambulances.
2. Identify the inputs to those activities and their sources.
  - E.g. Emergency call from the public.
3. Identify the outputs to those activities and their recipients.
  - E.g. Ambulance arrivals at incident scene.

The Work inputs and outputs are the phenomena that matters for evaluating the project success or failure.

- Not relevant for project scope:
  - ambulance allocation to incident (inside the world)
  - city's total mortality rate (in wider environment, outside the project's responsibility).

# Common scoping errors

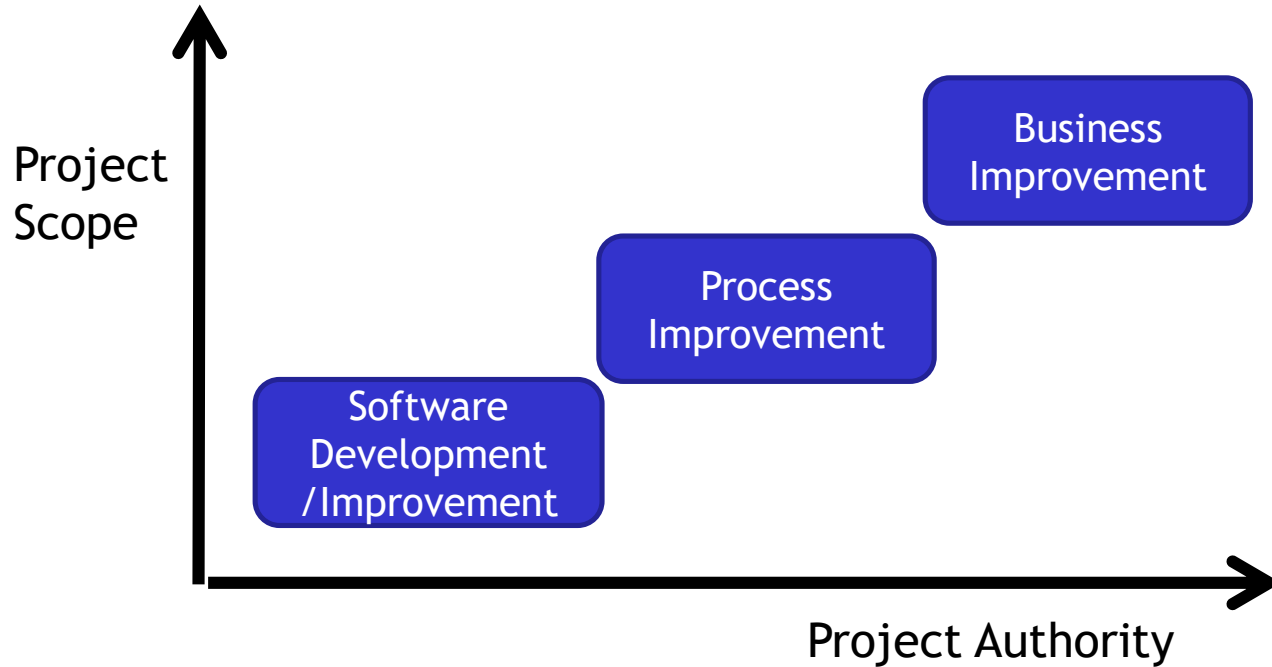
## 1. Project scope **too narrow**

- Product-centric scope; no other actors in the Work than the Machine (The Work = the Machine); .
- This might be a sign that you do not understand what real-world activities the machine needs to support. You risk building the wrong product, and you limit your abilities to discover innovative solutions.

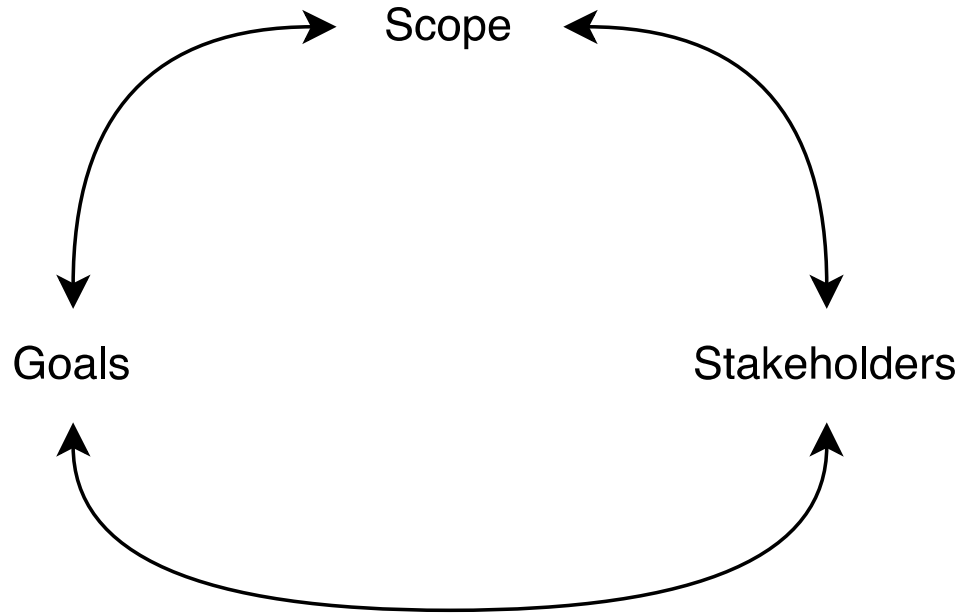
## 2. Project scope **too wide**

- The project scope include parts of the real world over which the project team has no control.
- Consequence: you will waste effort investigating problems and proposing solutions that are beyond the project authority.

# Relation between Project Authority and Scope



## Scope, Stakeholders, Goals - An iterative discovery





### 3. Identifying stakeholders

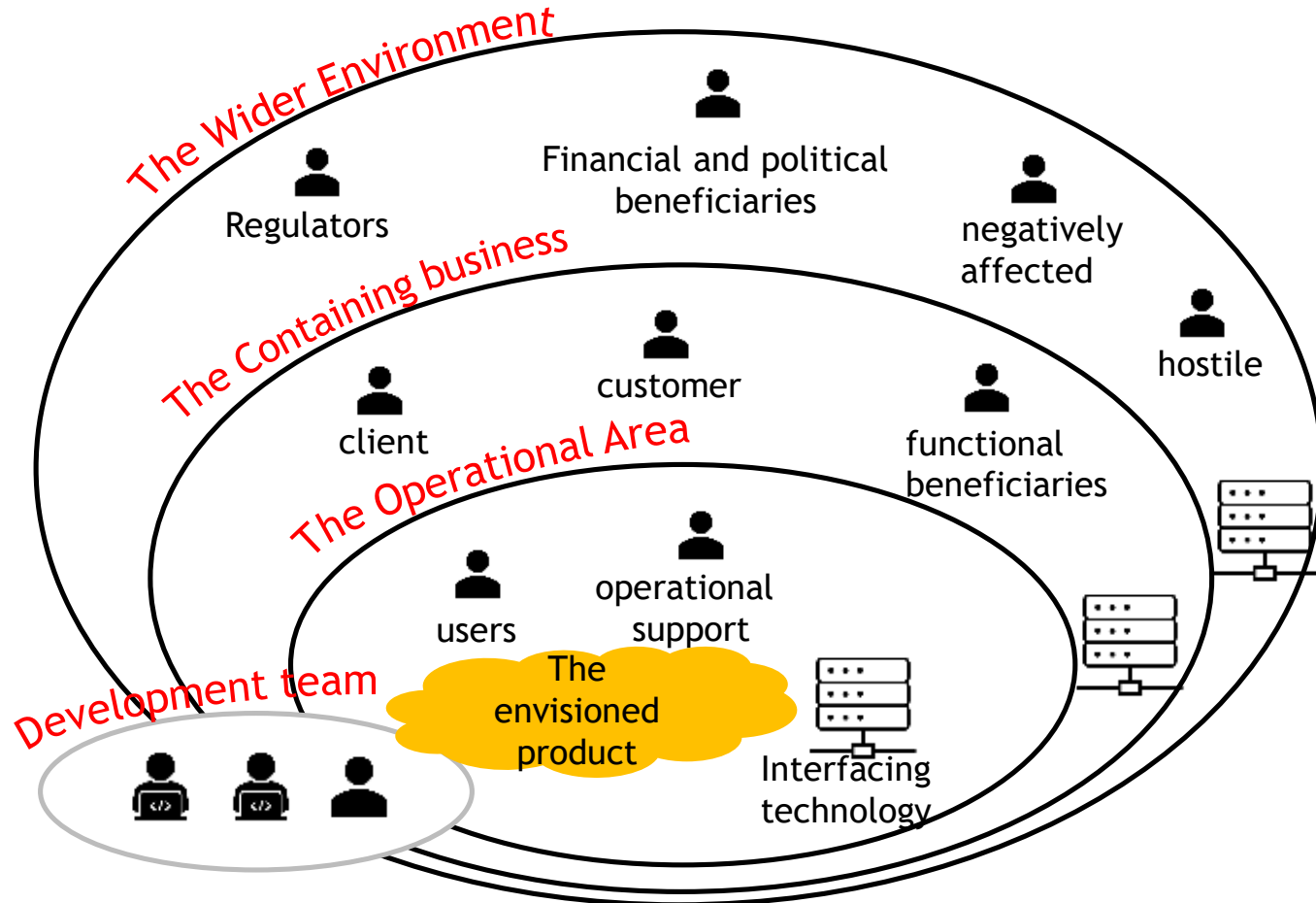
# Stakeholders

A *stakeholder* is a person or group of persons who have an interest in, or are affected by the Machine.

Often many more stakeholder than the client and users!

Failing to consider some important stakeholders can have adverse effects on the people overlooked, lead to costly changes, or to partial or complete project failure.

# The Stakeholder Onion Model



# The operational area

*All stakeholders who interact directly with the product.*

- **Users** (“normal operator”) will operate the product
  - Consider different **categories** and **profiles**
  - Model users with **personas** (detailed descriptions of imaginary representative users)
- **Operational support** operate the product to help users (e.g. helpdesk)
- **Interfacing technologies**
  - all external systems that have interfaces with the product.
  - The stakeholders are the people who own or have knowledge of these systems.

# The containing business

*All stakeholders who benefit from the product in some way*

- The client pays for the product development.
- The customer buys the product once developed.
- Functional beneficiaries are the people who benefit from the work done in the operational area.

# The wider environment

*Other stakeholders who have an influence on, or interest in product.*

- Regulators and inspectors
  - legal requirements, safety inspectors, ...
- Financial and political beneficiaries
  - shareholders, politicians, ...
- Subject matter experts
  - domain expert, safety expert, usability expert, ...
- Negatively affected stakeholders
  - those who do not want product, are negatively affected by product, competitors.
- Hostile stakeholders
  - attackers, criminals, terrorists, ...

# The development team

The people who will design, develop, test, operate, maintain and evolve the product.

- The organisations who develop and operate the software have their own goals.
- Involving developers and testers in early requirements phases generates better requirements. It also generates a shared understanding of the project goals and context.
- Involving IT support teams helps identifying requirements to support system operation, maintenance and evolution.

## Discovering stakeholders

1. Use stakeholder onion model as a checklist.
2. For each stakeholder group, identify their main goals and concerns for the project.
3. Update the stakeholder list throughout the project.



## Describing stakeholder goals and concerns

Stakeholder	Goals and concerns
London Ambulance Service (client)	<ul style="list-style-type: none"><li>• Meeting Govt. Performance Standards</li><li>• Minimize operational costs</li><li>• Wants system ready within 6 months</li></ul>
Call Handlers (users)	<ul style="list-style-type: none"><li>• Be able to handle emergency calls quickly, accurately, and with all required information</li></ul>
Public (functional beneficiary)	<ul style="list-style-type: none"><li>• Fast ambulance arrival</li><li>• Efficient handling of emergency calls</li></ul>
Ambulance Crews (functional beneficiary)	<ul style="list-style-type: none"><li>• Want precise and timely mobilization instructions</li><li>• Want to be able to reach incident location quickly after mobilization</li></ul>
National and local government politicians (political beneficiaries)	<ul style="list-style-type: none"><li>• Want system ready before next election.</li></ul>

## 4. Defining the Project Goals

# Project goals

Project goals = short precise descriptions of the main expected impacts of the Machine in the World.

- They define the **project success criteria**. Ideally, observable and measurable.
- A subset of all stakeholder goals.

For an ambulance dispatching system:

Percentage of incidents for which the first ambulance arrives at the incident scene within 14' must be at least 95%. (1992 UK Gov. Standard)

For an airplane ground braking safety controller:

Reduce the number of accidents and incidents due to unsafe deployment when flying, and late or no deployment when landing.

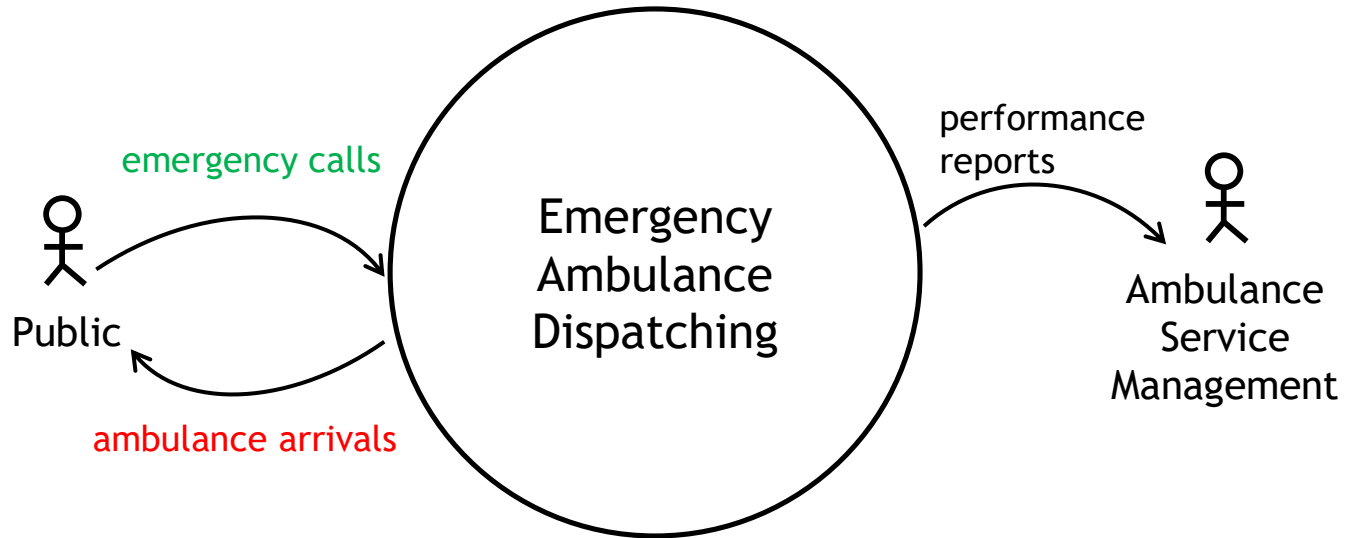
# Importance of clear and explicit project goals

- Keep the project focused on achieving its goals
  - All requirements must contribute to the project goals.
  - Requirements that do not contribute to the project goals should be removed (or the project goals extended).
- Provides a shared vision for the development team
  - Vague goals lead to lack of focus and wasted effort.
  - Team collaboration improves when members share a clear common goal.

Mitkidis et al., Collective-Goal Ascription Increases Cooperation in Humans, PLOS One, 2013.

## Project goals and project scopes are related

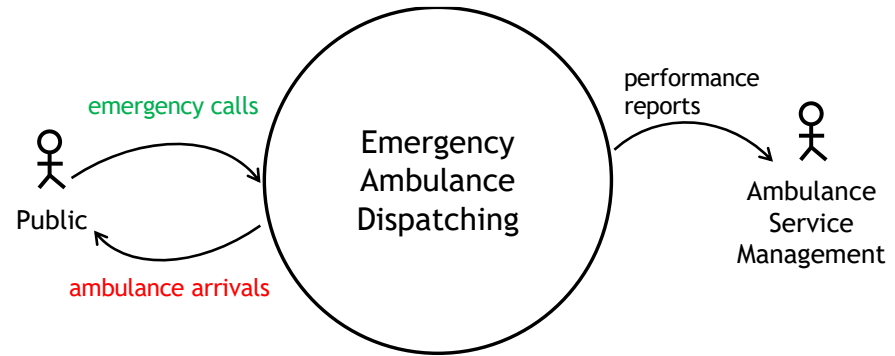
Goal: ambulance must **arrive at incident scene** within 14 minutes after first **emergency call reporting the incident**



## Practical Tips

1. Identify project goals from the Work context diagram
  - For each world inputs and outputs, consider potential project goals related to these phenomena
2. Define the Work context from the project goals
  - For each project goals, identify the relevant World inputs and outputs

Goal: ambulance must  
**arrive at incident scene**  
within 14 minutes after  
first **emergency call**  
**reporting the incident**



# Common Mistakes

## 1. Product-centric goal, no statement of impact.

*“The project’s goal is to develop an automated ambulance dispatching system that will use GPS and MDTs.”*

## 2. Vague and unmeasurable impacts.

*“The project’s goal is to improve the ambulance service efficiency.”*

## 3. Product-centric with vague impact.

*“The project’s goal is to use machine learning on healthcare data to improve the nation’s health.”*

Consequences: project lacks vision and direction, constant stream of changes, risk of building a system that has no real value.

# Discovering project goals: from vague to measurable

Some techniques

1. Look for the organization's performance indicators.
2. Look for evaluation metrics in the scientific literature.
3. Ask why questions: purpose-advantage-measurement.
4. Ask questions about observable changes.



# Look for organisation performance indicators

From London Ambulance Service Website in 2006

(New performance indicators have been introduced in 2017)

## Category A response times

Response times, broken down by Primary Care Trust (PCT) area, will be updated here on a monthly basis.

The figures relate to the first vehicle - whether it be a rapid response car, motorcycle or ambulance - to arrive at an incident. The national performance standard is to reach 75% of Category A (immediately life threatening) calls within eight minutes.

Proportion of Category A calls reached in 8 minutes: National standard = 75%

	Feb-06	Mar-06	Apr-06	May-06	Jun-06	Jul-06
Brent	78%	80%	82%	79%	72%	72%
Ealing	71%	76%	80%	74%	71%	71%
Hammersmith & Fulham	82%	84%	85%	83%	81%	73%
Harrow	68%	76%	75%	73%	72%	72%
Hillingdon	73%	78%	74%	72%	73%	69%
Hounslow	66%	75%	73%	68%	69%	74%
Kensington & Chelsea	69%	69%	68%	71%	68%	69%
Westminster	71%	75%	77%	72%	68%	74%
<b>NW London SHA</b>	<b>72%</b>	<b>77%</b>	<b>77%</b>	<b>74%</b>	<b>72%</b>	<b>71%</b>
Barnet	69%	70%	75%	68%	67%	64%
Camden	75%	81%	78%	74%	68%	74%
Enfield	81%	84%	82%	82%	73%	76%

# Look for goals in the scientific literature

Check whether relevant measurable goals already exist.

The screenshot shows a Google Scholar search for "ambulance dispatch". The search bar at the top contains the text "ambulance dispatch" and a magnifying glass icon. Below the search bar, the results are listed under the heading "Articles". On the left side, there are filters for "Any time" (with sub-options: "Since 2020", "Since 2019", "Since 2016", "Custom range..."), "Sort by relevance" (with sub-option: "Sort by date"), and checkboxes for "include patents" and "include citations". There is also a "Create alert" button. The search results list three articles:

- Decision support tools for ambulance dispatch and relocation**  
T Andersson, P Värbrand - *Journal of the Operational ...*, 2007 - [orsociety.tandfonline.com](#)  
In this paper, the development of decision support tools for dynamic ambulance relocation and automatic ambulance dispatching is described. The ambulance dispatch problem is to choose which ambulance to send to a patient. The dynamic ambulance relocation problem ...  
☆ [Cited by 255](#) [Related articles](#) [All 12 versions](#)
- Impact of ambulance dispatch policies on performance of emergency medical services**  
CS Lim, R Mamat, T Brauni - *IEEE Transactions on Intelligent ...*, 2011 - [ieeexplore.ieee.org](#)  
In ambulance location models, fleet size and ambulance location sites are two critical factors that emergency medical service (EMS) managers can control to ensure efficient delivery of the system. The ambulance relocation and dispatch policies that are studied in dynamic ...  
☆ [Cited by 75](#) [Related articles](#) [All 14 versions](#)
- Use of ambulance dispatch data as an early warning system for communitywide influenzalike illness, New York City**  
F Mostashari, A Fine, D Das, J Adams, M Layton - *Journal of Urban Health*, 2003 - Springer  
Abstract In 1998, the New York City Department of Health and the Mayor's Office of Emergency Management began monitoring the volume of ambulance dispatch calls as a surveillance tool for biologic terrorism. We adapted statistical techniques designed to ...  
☆ [Cited by 105](#) [Related articles](#) [All 8 versions](#)

Below the third article, there is a fourth article:

- Clinical evaluation of the Emergency Medical Services (EMS) ambulance dispatch-based syndromic surveillance system, New York City**  
J Greenko, F Mostashari, A Fine, M Layton - *Journal of Urban Health*, 2003 - Springer  
Abstract Since 1998, the New York City Department of Health has used New York City Emergency Medical Services (EMS) ambulance dispatch data to monitor for a communitywide rise in influenzalike illness (ILI) as an early detection system for bioterrorism ...  
☆ [Cited by 79](#) [Related articles](#) [All 8 versions](#)

## Ask “Why” questions

Practical tip: use PAM questions (Purpose - Advantage - Measurement).

Example: for a feature to detect duplicate calls

- What is the purpose of this feature?
  - *To automatically identify when an incoming call refers to an incident that has already been reported.*
- What are the advantages of identifying these duplicate calls?
  - *Not sending more ambulances than necessary to an incident.*
  - *Make it easier for call handlers to answer the call, deal with call backs, and update callers about progress.*
- How can these advantages be measured?
  - *By counting how often we have duplicate mobilisations.*
  - *By measuring times for handling duplicate calls and call backs.*

## Look for observable changes

Ask about **observable changes** that stakeholders want to see in the world.

Example:

*The new system should reduce stress for ambulance crews.*

- What would be observable changes if ambulance crews were less stressed?
  - *Fewer errors with patients*
  - *Fewer navigation errors and road accidents*
  - *Fewer sick leaves*
  - *Higher job satisfaction in surveys*
- You could also ask PAM questions: what are the advantages of reducing stress? How can these advantages be measured?

# Formulating Project Goals

## Simple

*use this to communicate project vision to stakeholders and development team*



- a list of goals defined in natural language

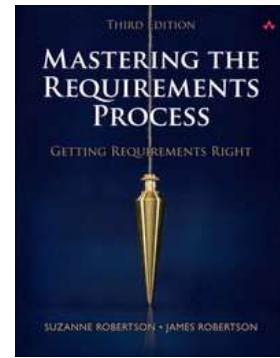
## Structured

- VOLERE Fit Criteria
- Quantitative Key Performance Indicators (KPI)

## Formal

- KAOS behavior goals and objective functions
- Planguage, Qper, ...

# VOLERE Fit Criteria



**Fit criterion:** a measurement used to evaluate how well a goal is satisfied

Example Fit Criteria for Ambulance System:

14 Minute Response Rate: each month, the percentage of incident for which the first ambulance arrives within 14 minutes after the first call.

	Current	Must	Target	Ideal
14_min_response rate	82%	82%	95%	99%

# KAOS behaviour goals and objective functions

**Goal Achieve** [Ambulance Intervention]

**Desired Behaviour**

GIVEN an incident has occurred  
WHEN the ambulance service receives a call reporting the incident  
THEN within 14 minutes  
a first ambulance arrives at the incident scene

**Quality Variable**

response\_time: Incident -> Time

**Objective Function**

Maximise 14\_min\_response\_rate =  $P(\text{response\_time} \leq 14')$

	Current	Must	Target	Ideal
14_min_response rate	82%	82%	95%	99%

## 5. Identifying Constraints and Risks



# Constraints

- Project constraints
  - Time constraints
  - Financial constraints
- Solution constraints
  - Design and implementation constraints
  - Other systems with which your product must interact
  - Mandated (or forbidden) off-the-shelf and open source applications

# Risks

Identify main **risks** and actions to control them

Practical tip: identify risks by negating project goals and constraints

Example for ambulance system

**Goal 1:** Improve 14 minute response rate

-> **Risk 1:** 14 minute response rate does not improve

**Goal 2:** No reported incident left unresponded

-> **Risk 2:** some reported incident left unresponded

## 6. Developing a Project Glossary

## Domain concepts

- Start writing **glossary** of main domain concepts
- Clarifying terminology early on helps reducing misunderstandings!
- Can be represented with a conceptual models of domain entities, associations and attributes

7. Should the project go ahead?

## Checklist: is the project worth doing?

- Clear Vision
  - are the project goals clear and unambiguous?
  - are they measurable?
  - do they provide benefits to the organisation?
- Feasibility
  - is it possible to achieve the goals within allotted time and budget?
  - are stakeholders willing to be involved?
- Risk Management
  - have risks been identified?
  - are there plans to track and control the risks?

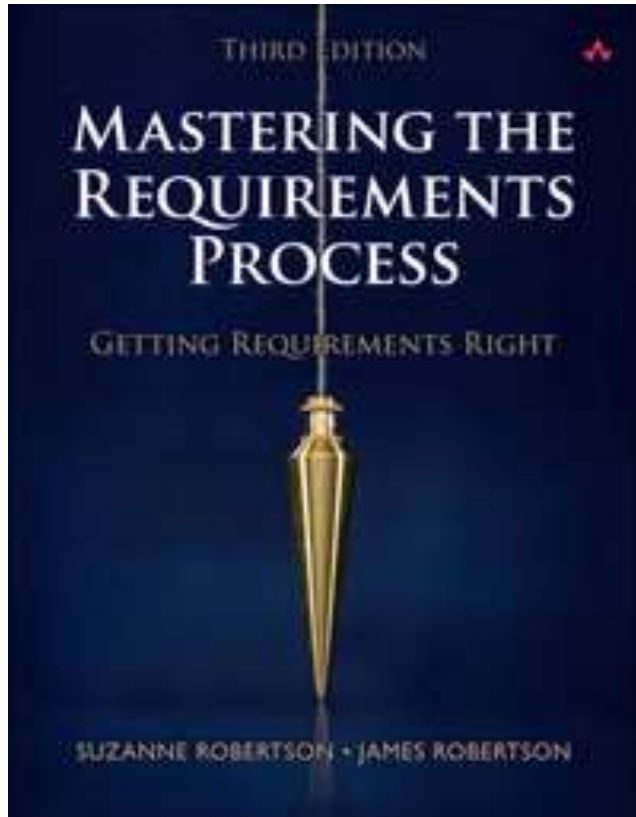
## 8. Summary

# Summary

- A good start is critical to the project success
  - Stakeholders, Goals, Scope
  - Need measurable and relevant goals
  - Start building project glossary
  - Identify constraints and risks
  - Feasibility analysis - cost/benefit, schedule
  - If too vague or not viable, do not start the project
- Can take a few hours to several days or weeks



## Reference and further reading



### Chapter 3: Scoping the Business Problem

Describes the VOLERE requirements engineering process

Available online from the reading list.