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Systems thinking for service design: A natural partnership

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Systems Thinking for Service Design: a natural Partnership

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Roadmap

- Design today: situations of increasing complexity, new paradigms
- Characteristics of such situations
  - Recognised limits of segmented thinking and disciplinary boundaries,
  - emerging questions
- Systems Thinking:
  - a short introduction
  - What can it offer to designers (theoretical underpinnings and practical tools)

Design today

Design is being called upon to deal with problems of increasing complexity and interdependence

- e.g. services, sustainability, social innovation

These problems are

“emergent phenomena with non-linear dynamics, uncertainties, and high political stakes in decision making, centred in complex heterogenous domains” (Bruce, 2004*).

(* commenting on the call for research in the European Fifth Framework Programme, 1998-2002)

Complex situations: characteristics

- These are problems that involve individuals and society and the world.
- They refer to the interaction of
  - humans with natural systems, such as the environment
  - human involvement with technological developments such as nuclear power.
- interaction with humans means interaction with elements of value and culture, e.g.:
  - ageing,
  - energy,
  - health care,
  - nutrition,
  - …Ebola care and management
- Hence Design more Human Centric and therefore more complex, and designers called upon to design Services

Dealing with complexity - transcending boundaries

- In the past problems were dealt with in terms of disciplinary and sectoral boundaries,
- We have exposed the limits of segmented thinking and problem solving (“a job for the engineers” or “for economists”)
- the multi/inter dimensionality of each of these subjects is now recognized
- however we are also realizing the need to ground more the transdisciplinary approaches

Dealing with complexity: transcending boundaries

- Multi-disciplinarity?
- Inter-disciplinarity ?
- Trans-diciplinarity?

- Need for the designer who is a “T - shaped Professional”

(Brown 2008)

- A parallel in the medical professions,
  - extreme specialization in medical education, leading to calls by medical professions themselves to address the issue..

Transcending boundaries: Service design

- Is the product in service design a byproduct of the design process?
- Is service design a new name for the evolving kind of design praxis which now
  - incorporates and welcomes complexity
  - considers more of the problem space than before

Systems Thinking

What is it?

- Sum is greater than parts…

System is …

- Interrelationships of parts of systems as important as parts…
- Not reductionist…

Systems Thinking: Core activities & grounding

Systems Thinking aids considerably:

- Problem identification
- Problem understanding
- Problem description (modelling)

- This approach together with mainly
  - cybernetics, cognitive science and complexity,

  offers a main platform/framework to design students and practitioners for reference and grounding.

Here we posit Systems Theory as contributing towards

- **a theoretical framework for Design Culture**
- a methodology for Design Practice

By way of introduction, Systems Thinking…

- Systems as an approach appeared more than half a century ago, in response to the failure of mechanistic thinking and vitalism to explain biological phenomena.
- It is a typical paradigm of an interdisciplinary domain, which in its trajectory through time and applications, has amalgamated other domains such as ‘Biology’, ‘Information Theory’, ‘Management’, ‘General Systems Theory’, ‘Cybernetics’ amongst others.

- 'System' is a complex and highly interconnected network of parts, which exhibit synergistic properties, where the whole exceeds the sum of its parts.
- Systems Thinking requires shifts from traditional classical decomposition or reductionist ways of doing things. It looks to understand the whole and the interrelationships within it, rather than just describe its parts.

By way of Introduction: Service Design….

- In the 1930s, nations' economies broke down their figures into three main sectors. These were, in order of economic importance, Agriculture, Manufacturing, and whatever was not either of these was grouped under the title of Services.
  - Today, the growth of what is traditionally called the ''service sector'' can be seen in the gross domestic product (GDP) statistics of nations. As currently measured, developed countries have 70–80% of their GDP and employment in the service sector (government, healthcare, education, retail, financial, business and professional, communications, transportation, utilities), with 15–25% in the manufacturing sector, and about 5% in the agricultural sector (Spohrer et al. 2010, Maglio et al, 2009).
- Traditionally the academic disciplines that worked on services were those of management and marketing, operations research and engineering.
- Services are considered as 'complex systems' in which specific arrangements of people and technologies take actions that provide value for others.
- Designers for the last two decades have been realizing a shift in working practices and output from product to systems design, that is, understanding the wider system in which the designed product is to function.
- This incorporates the users, producers, (including the designers themselves) the activities and functions expected, as well as the context of use, and constraints and freedoms offered by technologies used in the product. Such work has recently gone on under other labels, such as interaction design and/or user experience design (UX) as well as **service design**.

For Designers using Systems Thinking

- The design of a product / system will, in its life cycle, need to carry a wide range of aspects, notions and ideas and the relationships between them in the praxis of design.
- Designers should be encouraged to understand that
  - the wider their spectrum in examining a design problem,
  - the more they will gain in the robustness of their solutions.
- Time and resources constrain them, however, and direct their efforts to the inevitable reductionism.
- What designers should realise is that reductionism can lead to serious omissions if they ignore the consequences of not considering the power of Systems Thinking in design problem solving.
- Simply stated,
  - parts of a system (subsystems) cannot identify and show properties of the system
  - unless they themselves are considered and recognized as parts of it
  - and have their inter-relationships to each other acknowledged.

Concepts

- Complexity (unfortunately leads to attempts for reductionism)
- Emergent properties
- Variety (requisite variety)
- Self reference
- Closed (as far their organisation)
- Open (as far as energy and matter)

Services: 4 examples

1. Fire engines or fire prevention services (sending students to work in space before the brief)

2. Self Service Terminals

3. Interior design: brief for new office layout of workstations becomes re-design of whole of office space including “serendipity meeting spaces”)

4. Marine traffic: designed for one use, evolved to many services, beyond the original intended by design teams, including services to criminals: e.g. piracy, giving information to burglers…

Example 1: Fire engines for Syros

The brief was to design fire engines for the town of Hermoupolis, Syros.

The roads are narrow and steep, and some change into steps…

Conventional fire engine designs are not suitable for this environment


Kawasaki


KZP-6668

Systems Thinking

Can intervene in the design space “Before the brief”

It asks the question, “what is really wanted”?

Is it…

- Fire fighting equipment/vehicles…

Or ..

- safety, so no fires..

That is, what is the aim:

- fire prevention measures, stopping fires happening, or dealing with them when they are happening?

Example 2: Requisite Variety

Accessibility problems = design opportunities

For older people, or those with a disability, or simply non-native speakers, using self-service terminals (SSTs) may be difficult, or even impossible

- Wheelchair users may not be able to get close to the controls of the SST
- For partially sighted users, the print on the screen or the buttons may be too small or without sufficient contrast
- People with literacy problems or older people may find that SSTs time them out, because they need longer to make the decisions asked for by the SST
- Touch screens present difficulties for those with hand tremors

- Yet such needs, if recognised, can actually offer creative opportunities for designers, that enhance the usability and accessibility of the SSTs and the services for everyone, by offering alternatives.
- This is known in Systems Thinking as the notion of “requisite variety”

Example 3: the notion of emerging properties

- In designing a typical workstation for a member of staff to be operational as possible and accommodating all his needs for performing assigned duties.
- Emphasis will typically be given to
  - the type of work, the space available, regulations, the location of working places
- However, this might not ‘bring up’ some emerging properties which will make the end result more successful. That is, since in the office there will be more than one member of staff, the design should be able to accommodate ‘conversation’ and ‘collaboration’.
- That need may considerably change the understanding of office design.
- Then knowledge about requisite variety leads the designer to address accessibility issues in the station itself as well as in the location/ allocation of these stations in the office, so they can be used by people with special needs
- Such understandings can radically change **all** of the thinking about the design and layout of the workstations.

Utilising the notions of complexity and variety

Complexity should be welcome because of the richness it offers

- Subscribe to the view that the more complex a system appears to be the 'healthier' it is, because if understood, it offers more ways to deal with problems than a less complex one.

Variety can be seen in a similar way

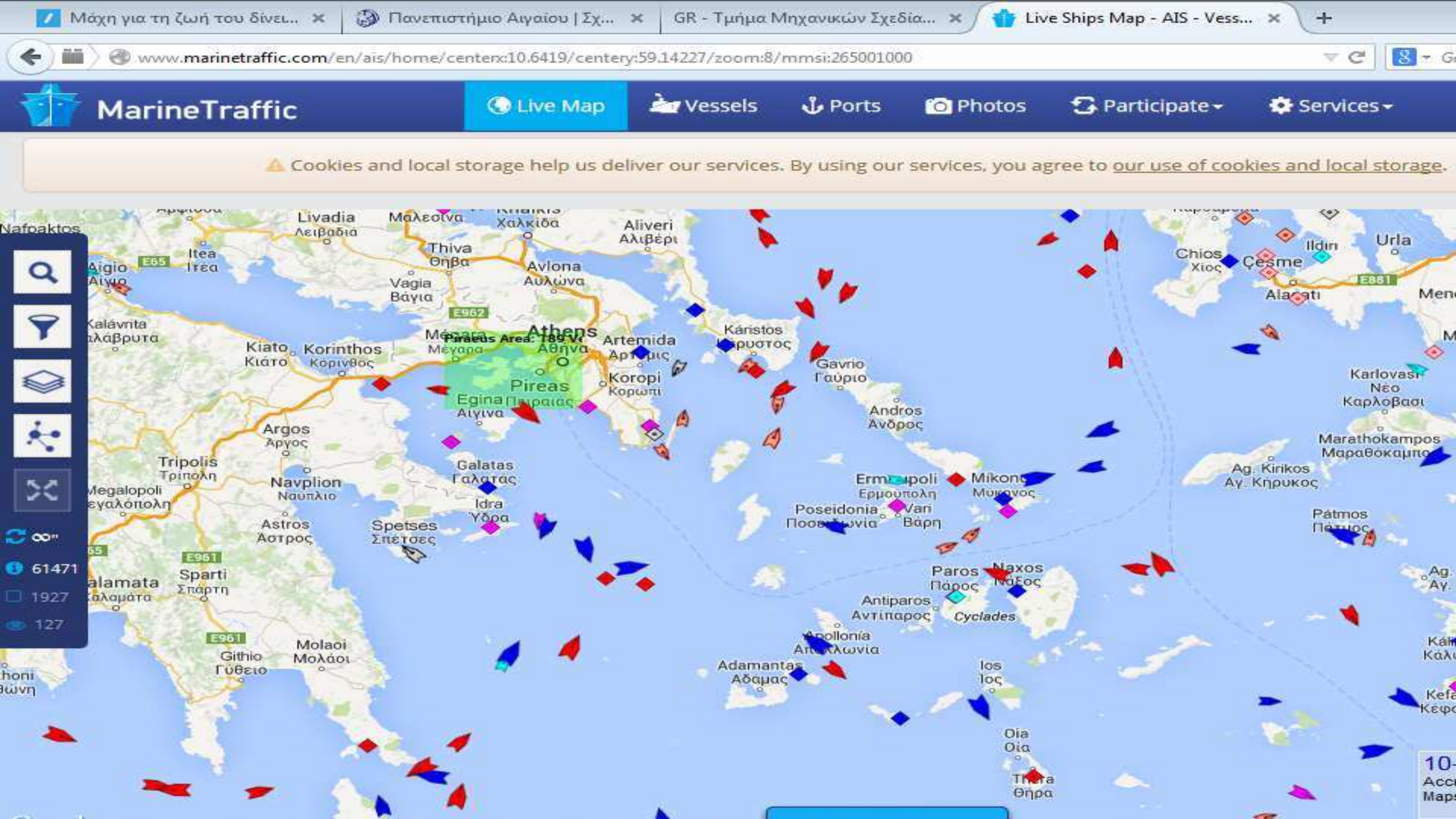
- Cybernetics provides the notion of requisite variety (i.e. the minimum number of choices needed to resolve uncertainty) to the property of self reference, as well as to many other emerging properties.
- in cybernetics it has been introduced to measure the potential of a system to defend itself against external threats or interference in the sense that only variety controls or defeats variety.
    - e.g. In the case of the design of self service or the actual SST, Systems Thinking designers will possess the knowledge to add in to their methods the determining of the variety of demands, i.e. the number of different service demands.

Designers should be aware of the usefulness of knowing the number of different ways users will demand service.

- They will know to look for the variety of services that should be provided and what the SSTs should be able to deal with.
    - e.g. notion of requisite variety for dealing with demand, will lead the designers to those involved in the relevant subsystems (e.g. Service Design) for dealing with, for instance, accessibility.

Marine Traffic

- A not so typical example of Service Design is one which could be based on the “Marine Traffic” information system, developed at the Department of Product and Systems Design Engineering of the University of the Aegean.
- This has proved to be a very successful crowd sourcing application which is tracking shipping through their Automatic Identification Systems (AIS), which is compulsory for every vessel including most recreational ones above a certain size.
- Technically, the system is based on specially designed aerials which are positioned all over the world by users following simple instructions and at a very low cost. An information system developed using Google Maps shows the position of the Ships at any time and also shows as much additional information about the vessel as their owners have included.
- Due to its large coverage, its potential for designing and developing various services / application is considerable. However it is also apparent that because of that rich potential and the fact that most services which come to mind are human centric, they are highly complex.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61471
1927
127
Livadia
Λειβαδιά
Thiva
Θήβα
Aliveri
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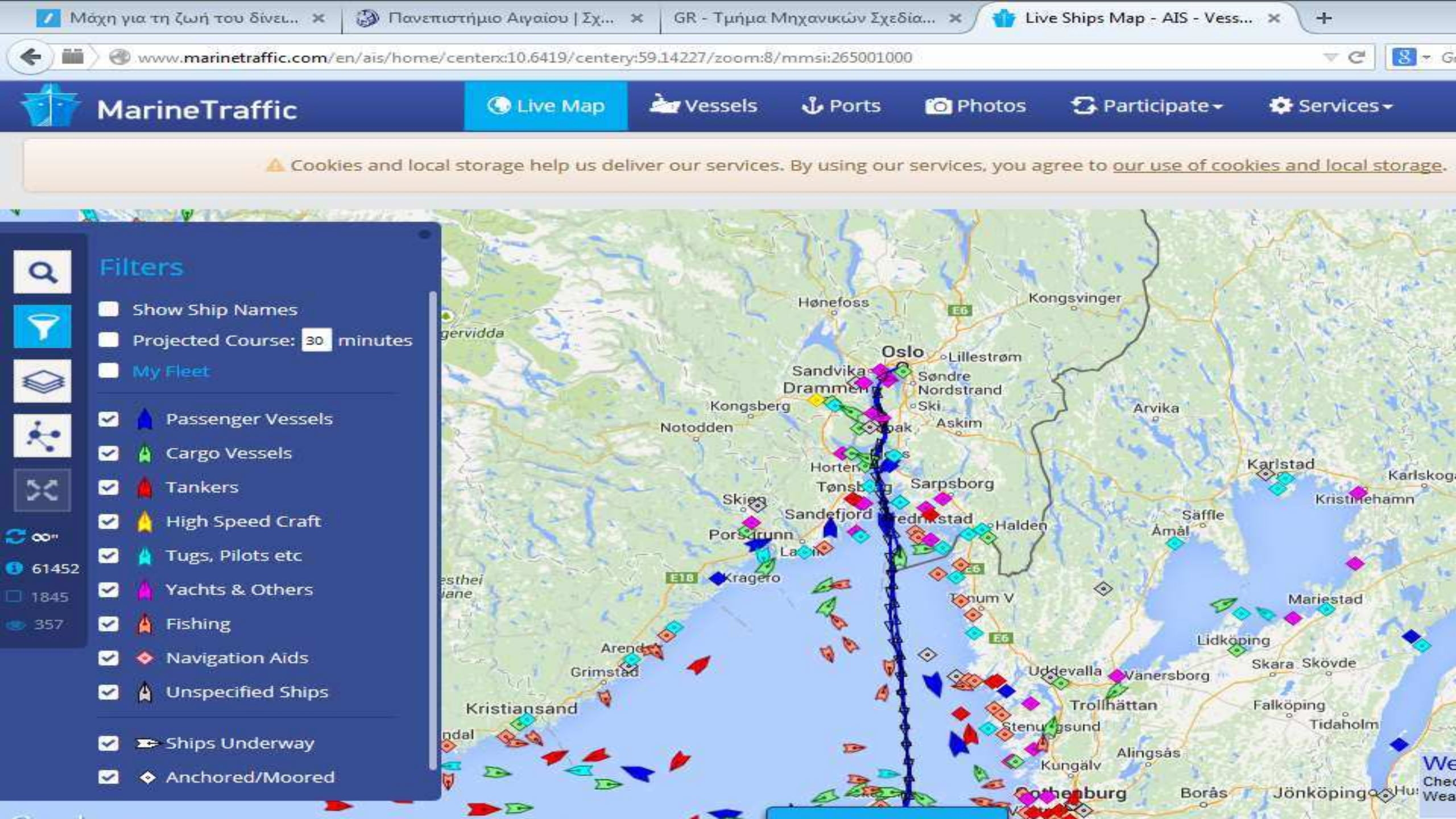
Avlona
Αυλώνα
Kiato
Κιάτο
Korinthos
Κόρινθος
Athens
Αθήνα
Piraeus Area
Artemida
Koropi
Κορωπί
Pireas
Πειραιάς
Egina
Αίγινα
Káristos
Gavrio
Γαύριο
Andros
Άνδρος
Karlovasi
Νέο Καρλόβασι
Marathokampos
Ag. Kirikos
Αγ. Κήρυκος
Argos
Άργος
Tripolis
Τρίπολη
Navplion
Ναύπλιο
Galatas
Γαλατάς
Idra
Ύδρα
Spetses
Σπέτσες
Astros
Άστρος
Sparti
Σπάρτη
Githio
Γύθειο
Molaoi
Μολάοι
Mikonos
Μύκονος
Poseidonia
Βάρη
Paros
Πάρος
Naxos
Νάξος
Antiparos
Αντίπαρος
Cyclades
Adamantas
Αδάμας
Ios
Ίος
Oia
Οία
Thira
Θήρα
Pátmos
Πάτμος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Services
Cookies and local storage help us deliver our services. By using our services, you agree to our use of cookies and local storage.
Filters
Show Ship Names
Projected Course: 30 minutes
My Fleet
Passenger Vessels
Cargo Vessels
Tankers
High Speed Craft
Tugs, Pilots etc
Yachts & Others
Fishing
Navigation Aids
Unspecified Ships
Ships Underway
Anchored/Moored
61452
1845
357
Hønefoss
Kongsvinger
Oslo
Lillestrøm
Sandvika
Drammen
Søndre
Nordstrand
Ski
Askim
Kongsberg
Notodden
Arvika
Horten
Tønsberg
Sarpsborg
Skien
Sandefjord
Halden
Porsgrunn
Kragerø
Åmål
Karlstad
Kristinehamn
Säffle
Mariestad
Lidköping
Skara
Skövde
Uddevalla
Vänersborg
Trollhättan
Falköping
Tidaholm
Alingsås
Kungälv
Borås
Jönköping
Grimstad
Kristiansand
E18
E6

IMO: **7911545**
MMSI: **265001000**
Call Sign: **SLVH**
Flag: **Sweden (SE)**
AIS Type: **Passenger**

Gross Tonnage: **33967**
Deadweight: **3898 t**
Length × Breadth: **166.7m × 29.04m**
Year Built: **1981**
Status: **Active**

Last Position Received

In Range

Info Received:
4 min ago (2014-10-12 20:32)

Area: **Skagerrak**

Latitude / Longitude:
59.14227° / 10.6419°

Status:
Underway using Engine

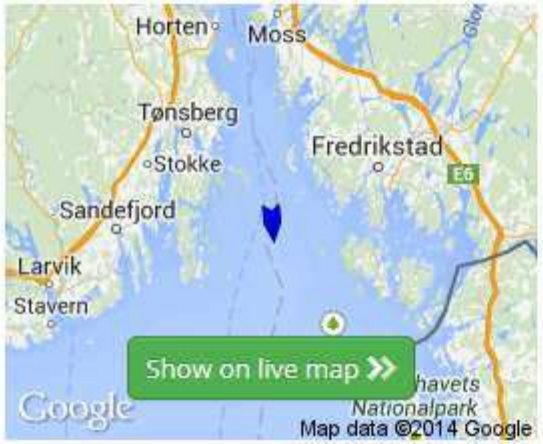
Speed/Course:
15.4kn / 177°

AIS Source: **688**

Itineraries History

Latest Positions

Nearby Vessels



Wind: **8 knots**
Wind direction: **W (263°)**
Temperature: **12°C**




Upload a photo | Ship Photos: 126

One group of popular applications is the information dissemination as to whereabouts of shipping at any time. That type of service is used by individuals, travel agents, authorities and so on. A typical application for instance is the passenger shipping in the Aegean Islands. Below an indication of the characteristics and potential uses of the system are given.
Marine traffic exhibits contemporary characteristics: it is crowd sourced, open access and deals in big data. Its use (by its designers) was foreseen as primarily providing information in real time on passenger ferry movements, as well as information about the movements of amateur sailors. Since then, there have been a number of documented uses by different sets of users, looking for information gained from the same data, for example:

- by the public: such as tracking their loved ones who are travelling
- by travel agencies to give information to their customers;
- by government agencies for surveillance (smuggling, illegal dumping of waste, illegal bunkering, and suspicious movements); for safety operations such as collision avoidance and search and rescue;
- by insurance companies investigating claims who turn to Marine Traffic for logged ship movements.

In Conclusion

- When Complexity increases ,what is needed is not products, but services

- Complexity leads to applying systemic thinking to the problem, the tenets of systemic thinking lead the designers into services

- Codesign needs Systems Thinking

- Complexity increases, the problem is re-defined,
- Movement from product,
- through product service system, (PSS)
- to service

Inter-disciplinarity, Multi-disciplinarity and Trans-disciplinarity

- Despite more than 40 years of cross-disciplinary practice in universities there is still a lack of precision about what the terms ‘inter-disciplinarity’, ‘multi-disciplinarity’ and ‘trans-disciplinarity’ actually mean.
  - Multi-disciplinarity describes situations in which several disciplines cooperate but remain unchanged
  - Inter-disciplinarity there is an attempt to integrate or synthesise perspectives from several disciplines
  - Trans-disciplinarity, on the other hand, has been taken to involve a transgression or transcendence of disciplinary norms
    - “whether in the pursuit of a fusion of disciplines,
    - an approach oriented to complexity or real-world problem-solving,
    - or one aimed at overcoming the distance between specialised and lay knowledge or between research and policy”

Example 4: Medicines, their packaging, their PILs*

- If this is considered as a packaging problem and also as a system and if the designers involved resist reductionism
- then the design problem will, in its rich systemic view include all possible subsystems, with a 'thick' description of the interrelationships between the parts of the systems and subsystems, for instance
  - the type of medicine (including the degree of danger if used wrongly).
- This approach will :
  - lead to more appropriate definitions of the stakeholder groups (patients, carers
  - emphasise aspects like the ergonomics of the container, the size of lettering
  - make emerge a "complex" way of describing the use, by which is mean a model of information with an appropriate variety of ways to offer the necessary explanations.

- We must not forget that here complexity is not the opposite of simplicity -
- Rather they work together in 'making life better' by offering a rich adaptable guidance for as many types of users as possible.

*PILs (Patient Information Leaflets)

In conclusion

Design methods, methodologies, techniques etc, in order to utilise Systems' theoretical approach, have to be applied, acknowledging the existence and the role of the human problem owner.

- the user/human cannot be removed from the design problem.

For its part, Service Design, following service science priniciples, understands that a service is a value proposition between customers and providers, and requires to be co-designed.

The practices of the co-designing help with the application of Systems Thinking.

Acknowledging that the human is part of the Design Problem, allows designers to retain and utilise its systemic nature with its calculation and self organizing capabilities.

- All the above are valid in living systems (organisms) where their systemic nature allows for the notions of self organization, autopoiesis, and calculation.

As a result a number of emergent properties of a designed system could influence the end result as well its life cycle.

- This makes a natural partnership between service design and systems, but also offers to Designers engaged in service design an approach that offers understandings of both designers and participants and helps in the emergence of more robust services.