# Towards an Understanding of Smart Service: The Case Study for Cultural Heritage e-Tourism

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# Introduction

- various tourist applications for gathering required information before the trip or during the trip
- the particular problem is the case of mobile and personalized trip assistance services for tourists
- a promising way to digital service development is smart spaces and smart services:
  - operation with multiple data sources
  - service construction
  - personalized situation
  - proactive service delivery

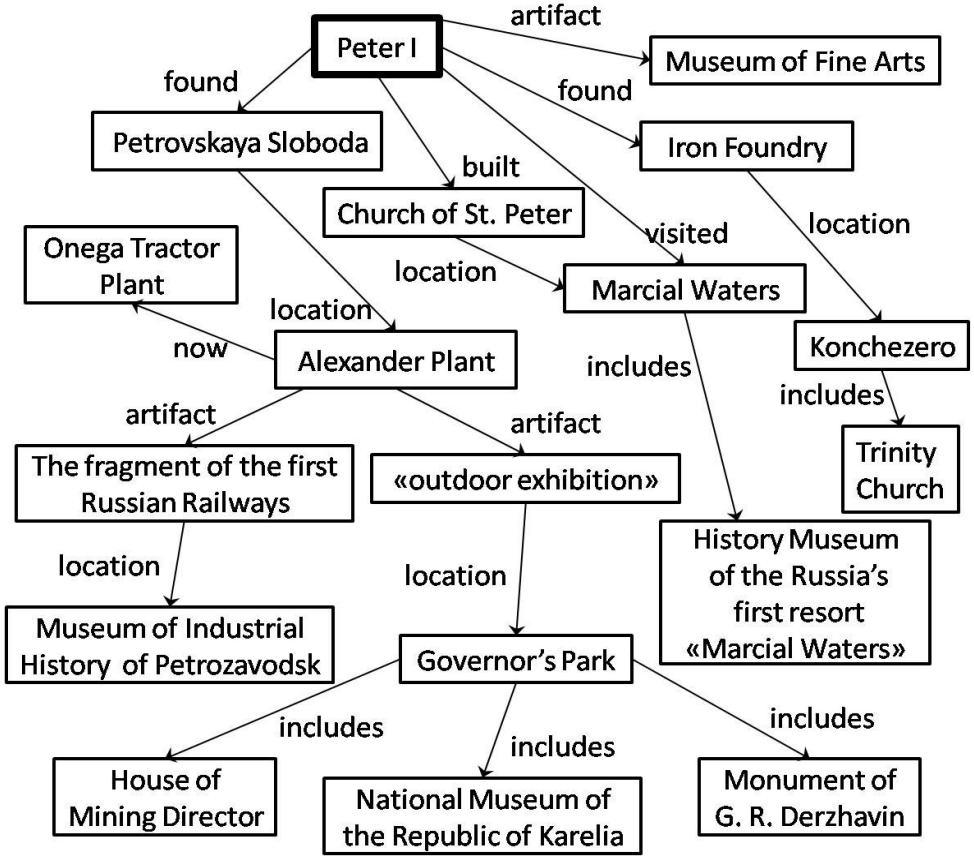
| Phases of tourism activity |
| --- |
| Trip Elaboration |
| Trip Planning |
| Trip Execution |
| Post analysis |

# Example 1/2

*Trip Elaboration*

| | |
|---|---|
| Target region | Petrozavodsk city and its surroundings |
| Budget | non-expensive attractions |
| Time period | free 1–2 days |
| History interests | the industrial history of the region |

- tourist has selected some POIs
- semantic network: information on POIs and historical facts




*Example of a semantic network of POIs in Petrozavodsk*
*History interest is the industrial history of the region*

# Example 2/2

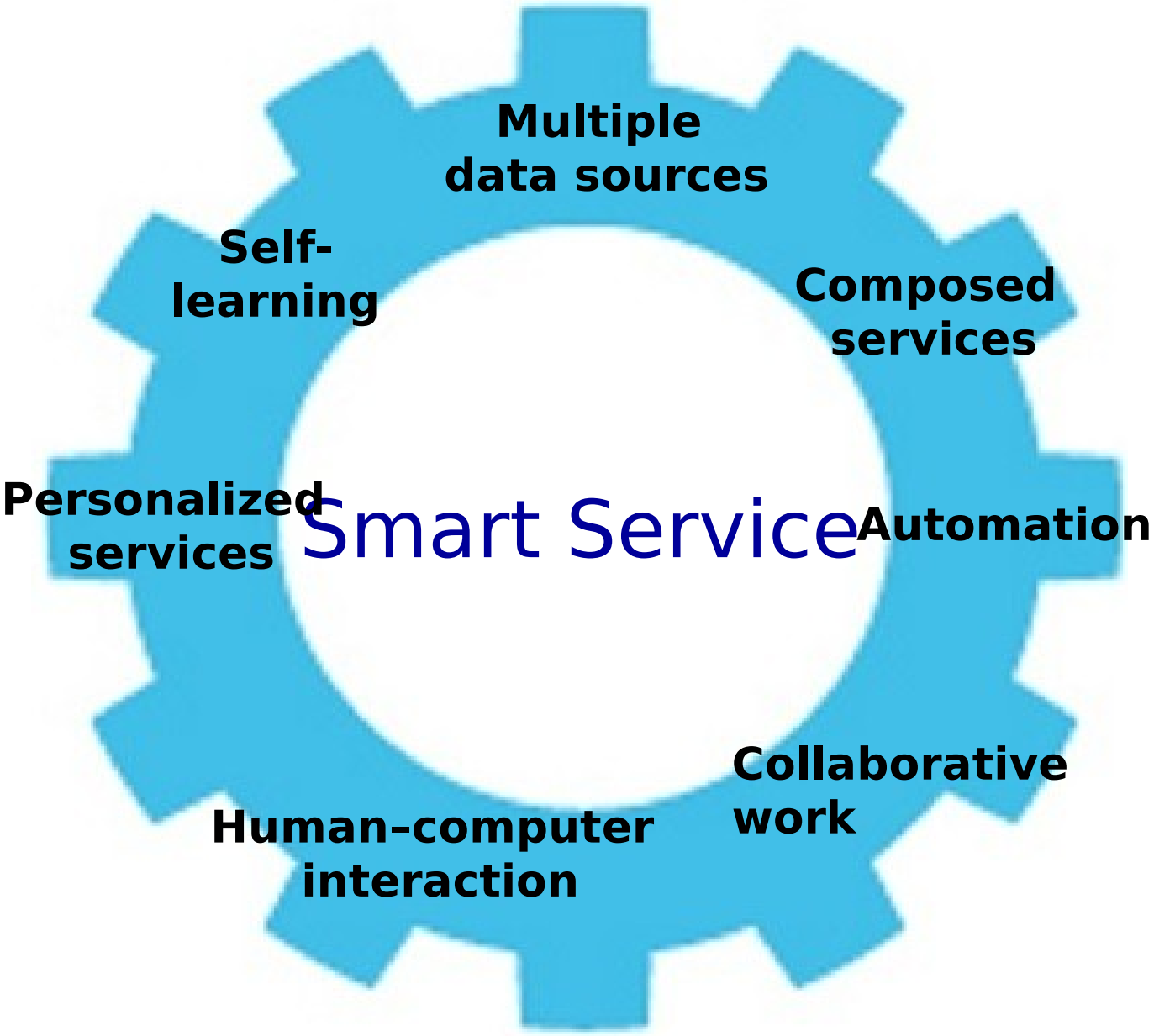
## *Trip Planning*

- decides a way of transportation
- sorts the list of selected
- POIs according to the personal preferences and interests
- constructs a route of the trip from the POIs

## *Trip Execution*

- navigation
- gathering data about POIs
- modify and adapt the route

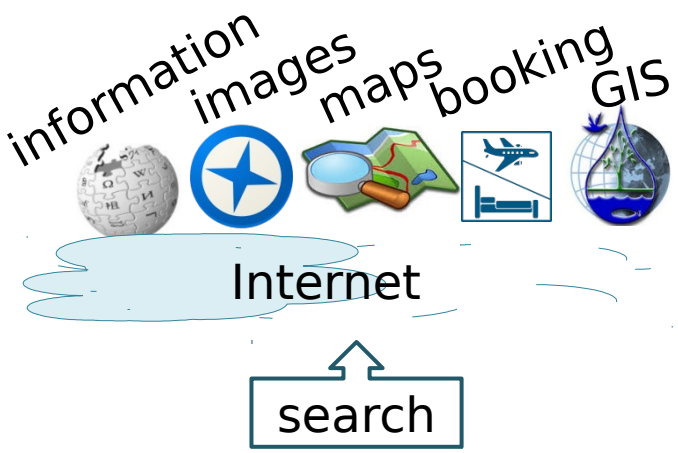

*An example of route for walking tour in Petrozavodsk*


Multiple
data sources
Self-
learning
Composed
services
Personalized
services
Smart Service
Automation
Collaborative
work
Human–computer
interaction

# Smart Service Attributes 1/7

## *Multiple data sources*

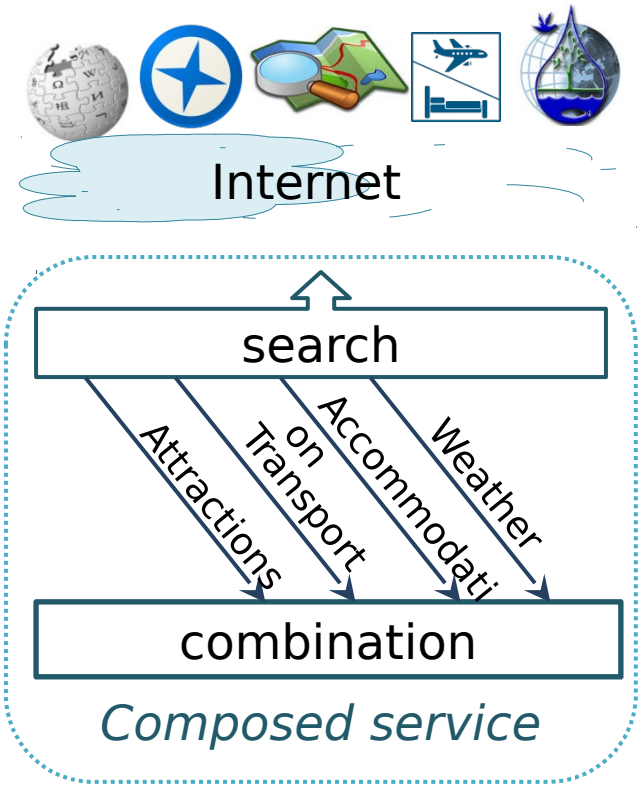
- service uses a set of third-party data sources
- implementation difficulties:
  - merging data from different sources
  - organizing search requests
- example: a service can request and combine information from different data sources



# Smart Service Attributes 2/7

## *Composed services*

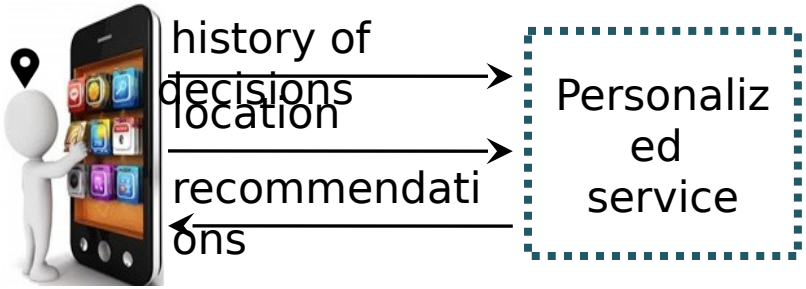
- service applies external services
- difficulties:
  - implementation and maintenance of different application programming interfaces of third-party services
  - the increased computation time
  - higher network traffic
- can be implemented within a multi-agent system
- agent becomes responsible for the interface
- example: a combination of a trip planning service with a public transport service



# Smart Service Attributes 3/7

## *Personalized services*

- service provides information depending on the user profile or context
- the possibility to sort data by user interests, filter uninteresting data
- difficulties:
  - mapping user interests with search results
  - algorithms of data sorting and data filtering
- examples of personalization:  user location, history of decisions



# Smart Service Attributes 4/7

## *Human–computer interaction*

- service provides effective human–computer interface
- clear user interface that provides information in a user-friendly and readable form
- difficulties:
  - high computation
  - equipment costs
  - complicated algorithms
- example:  a voice input and output

# Smart Service Attributes 5/7

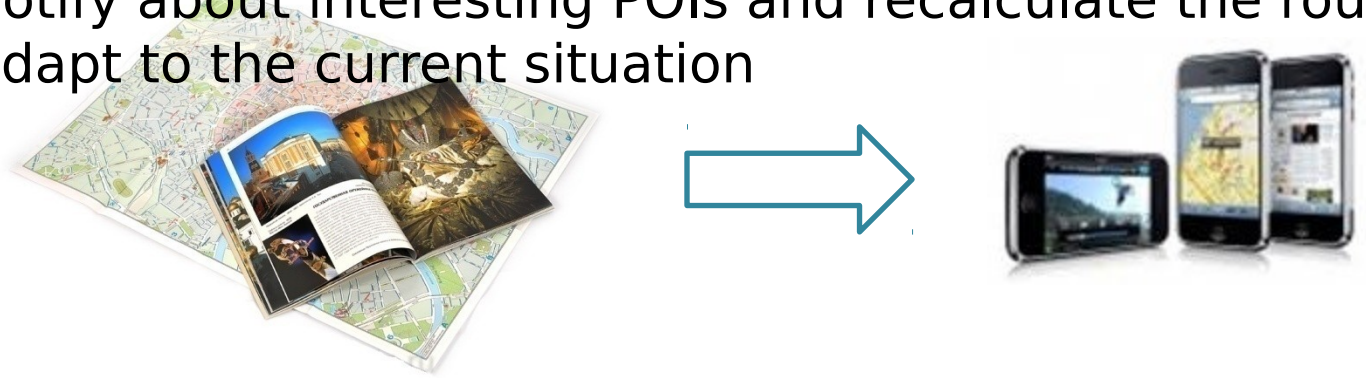
## *Self-learning*

- service has this attribute if it can recognize and generate new knowledge
- expansion of the available knowledge, generation of new relations between POIs, …
- difficulties:
  - computational costs
  - complex algorithms
  - closed area with predefined rules
- example: analysis user profile and user context to detect preferable objects to visit

# Smart Service Attributes 6/7

## *Automation*

- service automates operations for human
- decrease the number of manual operations, to reduce human-made errors, and to increase the overall performance
- difficulties:
  - increased computational costs
  - more complicated algorithms
- example: service can automatically detect tourist time plan, notify about interesting POIs and recalculate the route to adapt to the current situation



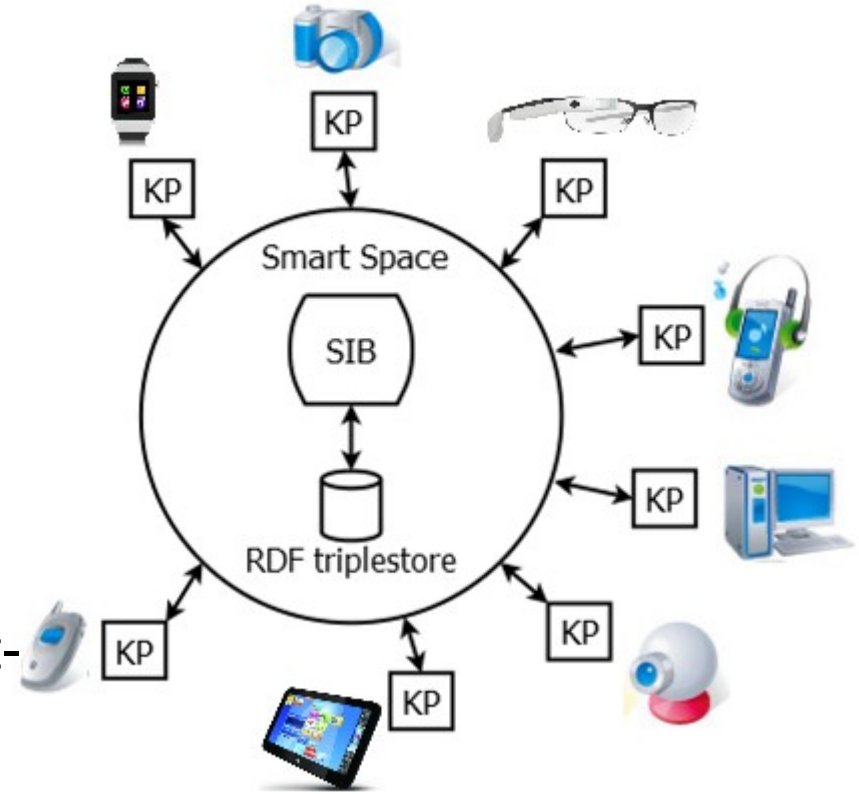
# Smart Service Attributes 7/7

## *Collaborative work*

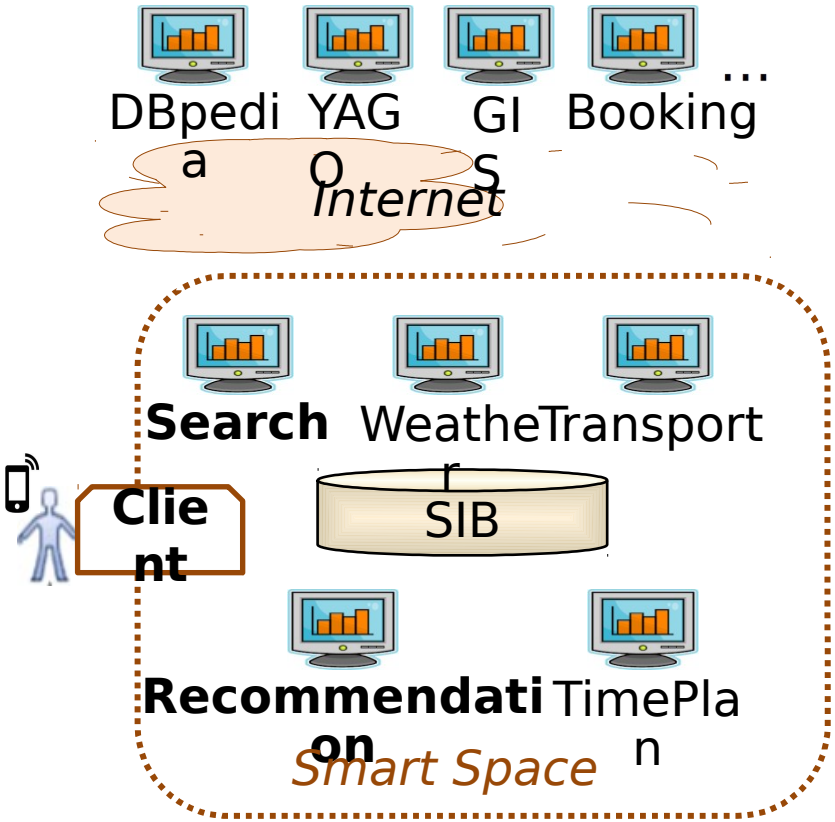
- service provides the ability to cooperate to the users
- difficulties:
  - increased computational costs
  - storage size
  - trust issues
  - low performance of collaborative decision-making
- example: tourist receives travel advices and travel-related information from other users by using the collective intelligence of a web-based social network

# Smart Spaces

- multi-agent knowledge base
- smart environment: “agents” and ”hub”
- each agent is an autonomous knowledge processor (KP)
- the hub becomes a semantic information broker (SIB)
- maintain an RDF triplestore
- technological platform is Smart-M3

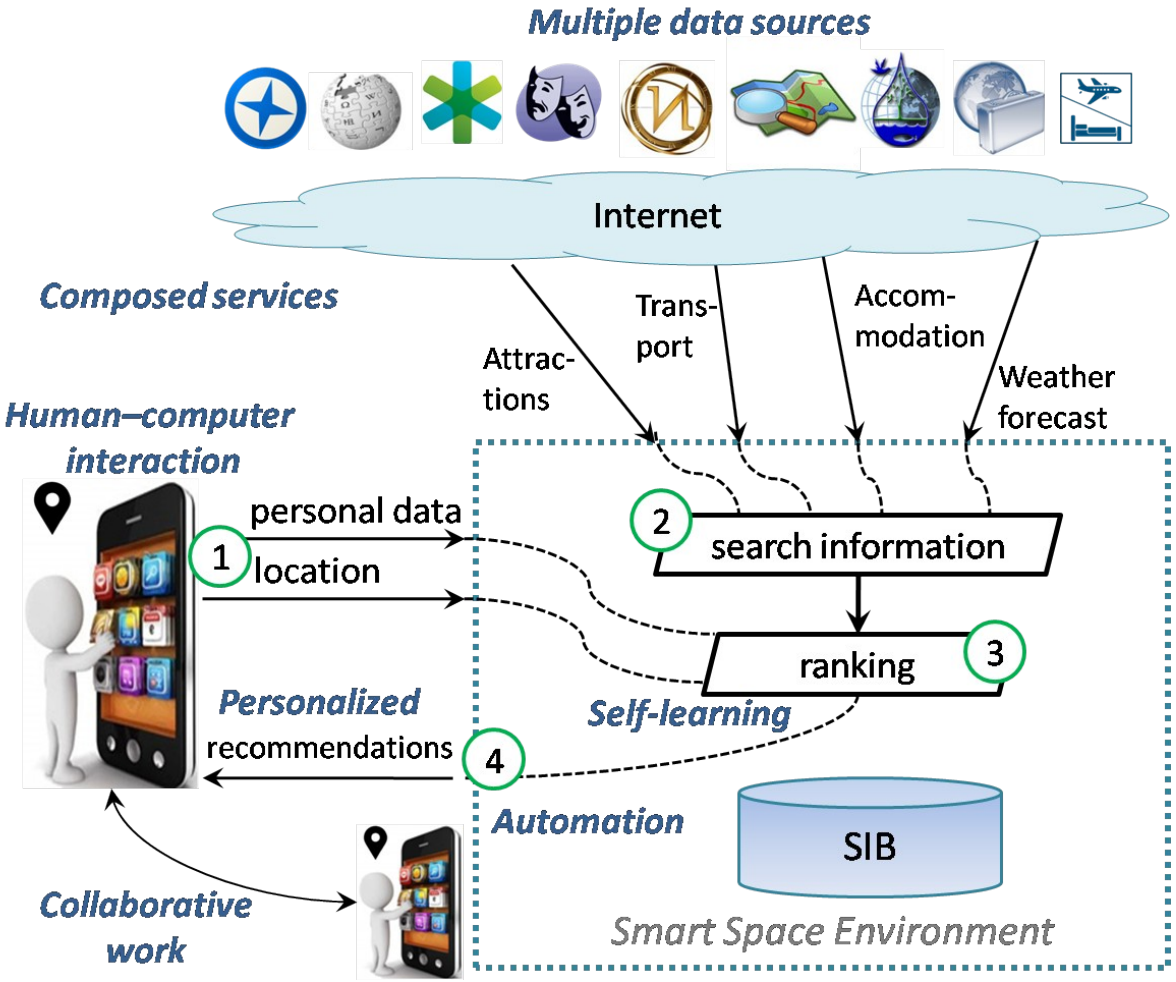


# Smart Space Based System Design




- development of smart services as a smart space
- **client** publishes personal data and information about the user's preferences
- **search** interacts with external Internet services
- **recommendation** computes ranks of POIs depending on the user's preferences and the visiting history
- additional services can be added to the system

# Application scenario



# Conclusion

- scenario of mobile and personalized trip assistance in cultural heritage tourism
- smart service attributes
- design solution to development of smart services as a smart space
- the proposed system design enables the identified smart service attributes and can be used beyond the cultural heritage e-Tourism

Thank you for attention!