SURVEY OF ISRAEL

MINISTRY OF CONSTRUCTION AND HOUSING

BUILDING NATIONAL DATABASES USING EXPERT SOURCING

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Chief Scientist

20 November, 2018

Contents

- Background on internet Eras
- What is a data lossless nation?
  - Data products in the construction process
  - National mapping standard
  - The Inter-agency GIS committee
- On-line QC tool
- The data integration tool
- Conclusions

Internet eras

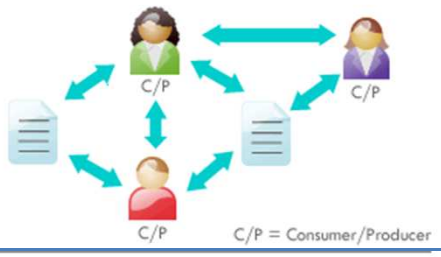
One organization providing information (Read)

Web 1.0

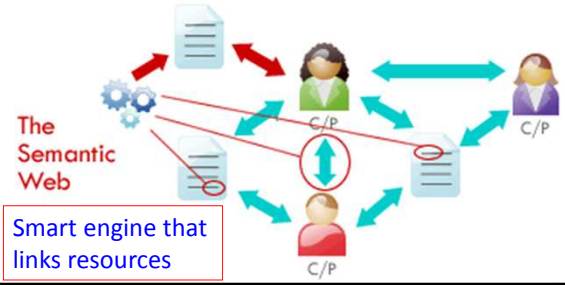
Collaboration with the public (Read and write)

Wiki, facebook, youtube, waze

Web 2.0



Web 3.0: Smart and connected system (Read, write and understand)



Smart engine that links resources

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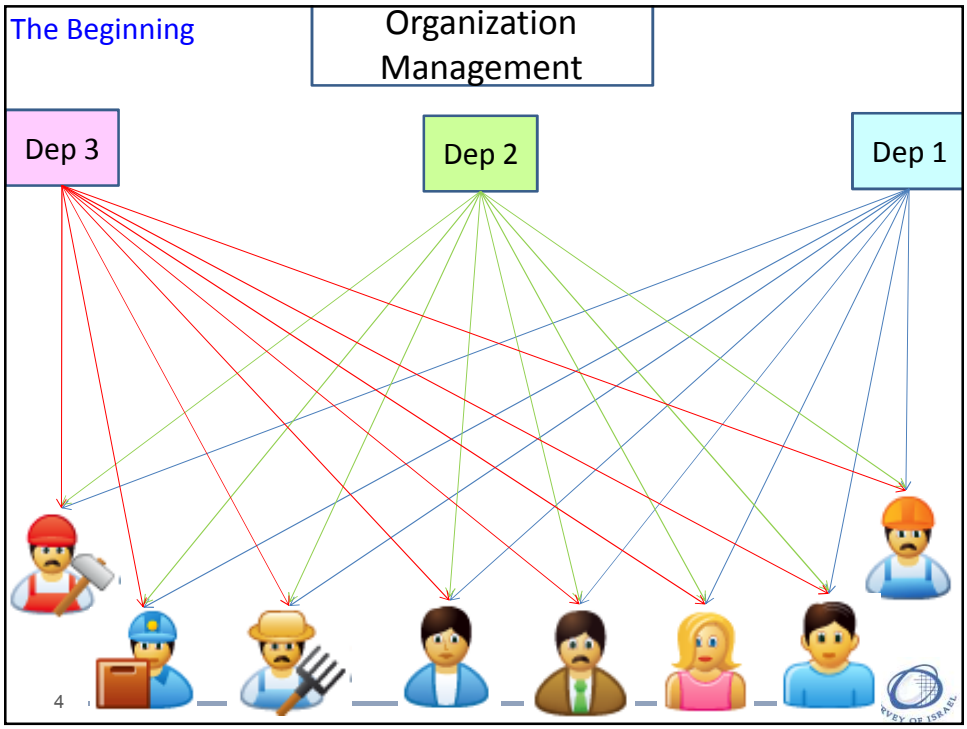
The Beginning



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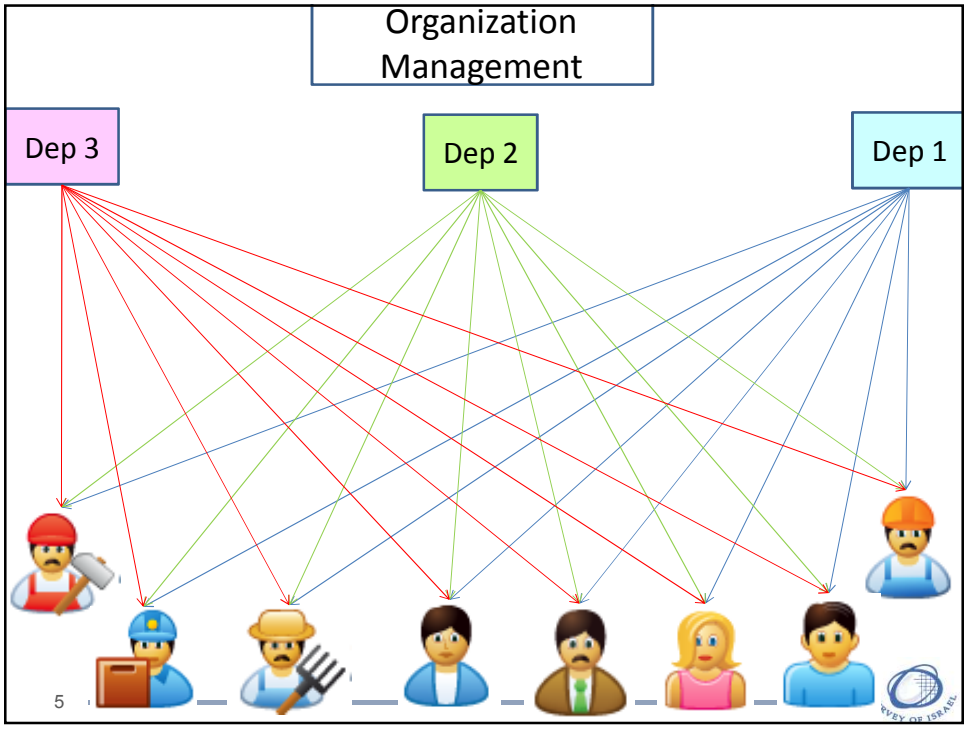
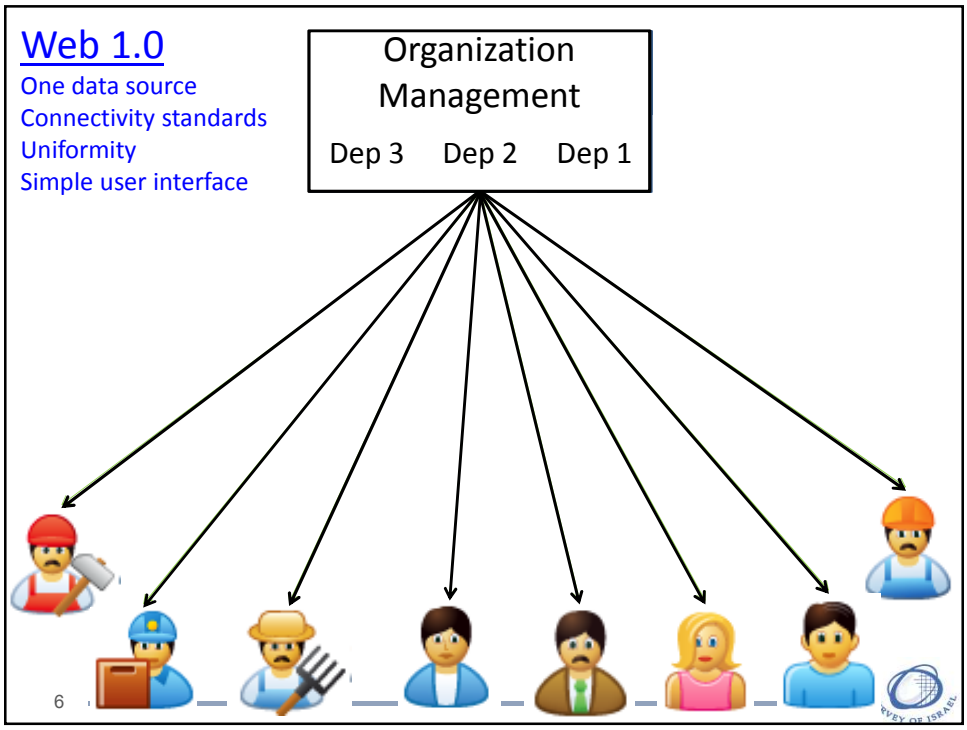
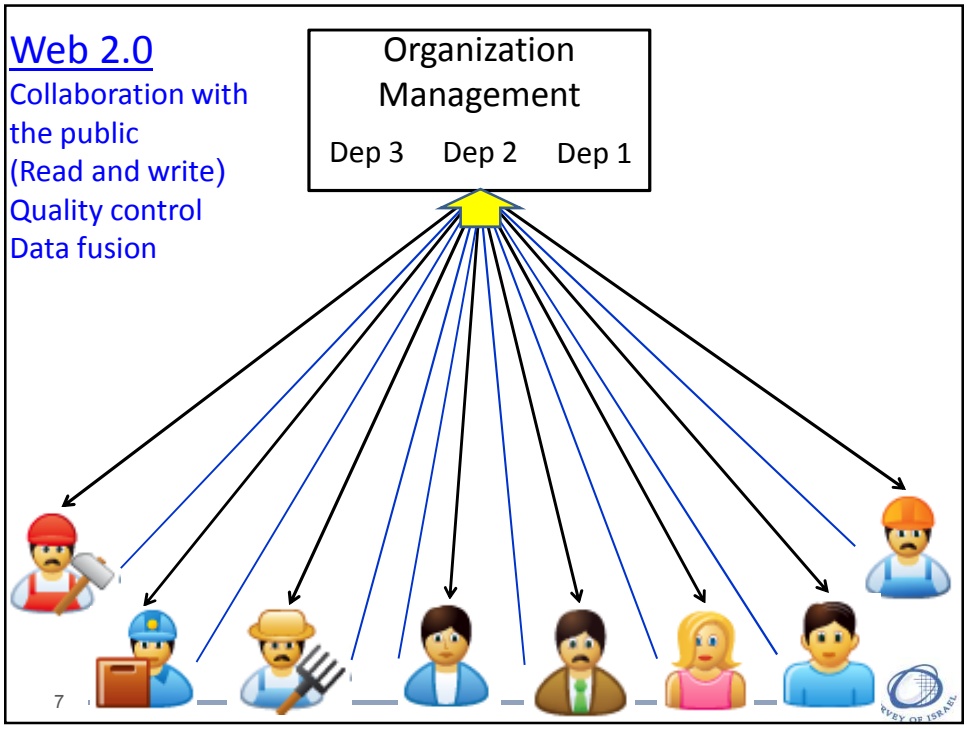

Organization Management
Dep 3
Dep 2
Dep 1
5


Web 1.0
One data source
Connectivity standards
Uniformity
Simple user interface
Organization Management
Dep 3 Dep 2 Dep 1
6


Web 2.0
Collaboration with the public
(Read and write)
Quality control
Data fusion
Organization Management
Dep 3
Dep 2
Dep 1
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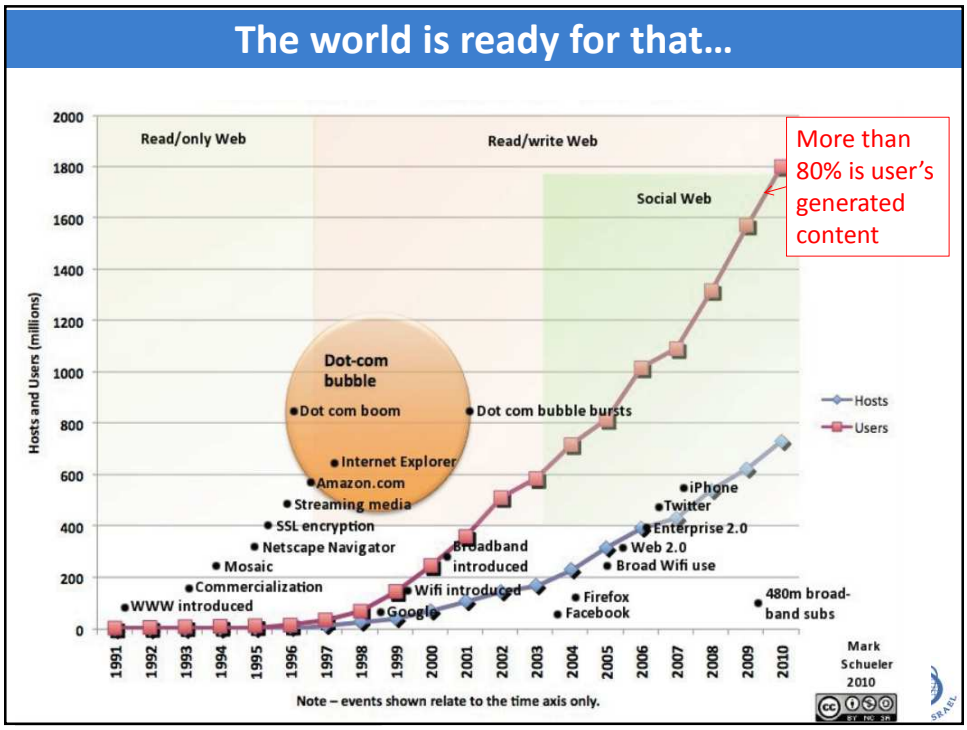
The world is ready for that…
Read/only Web
Read/write Web
Social Web
More than 80% is user's generated content
Hosts and Users (millions)
Dot-com bubble
Dot com boom
Dot com bubble bursts
Internet Explorer
Amazon.com
Streaming media
SSL encryption
Netscape Navigator
Mosaic
Commercialization
WWW introduced
Google
Wifi introduced
Broadband introduced
Firefox
Facebook
iPhone
Twitter
Enterprise 2.0
Web 2.0
Broad Wifi use
480m broad-band subs
Hosts
Users
Mark Schueler 2010
Note – events shown relate to the time axis only.

Crowdsourcing Vs wisdom of the crowd Vs Expert Sourcing

- **Crowdsourcing:** the act of obtaining information from a large group of people
- **Wisdom of the crowd** is the collective opinion of a group of individuals
- **Expert-sourcing:** the act of obtaining information from a large group of experts

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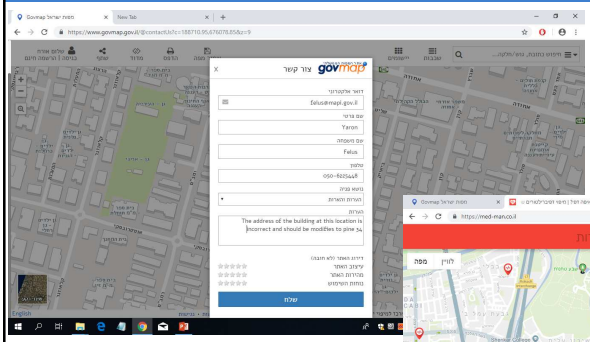
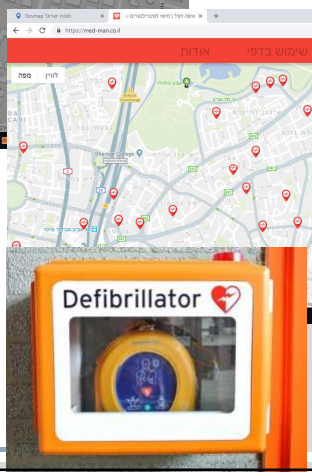
Crowdsourcing applications



Feedback and notifications on problems in Topographical DB at the National Geospatial Portal



Crowdsourcing of defibrillator locations

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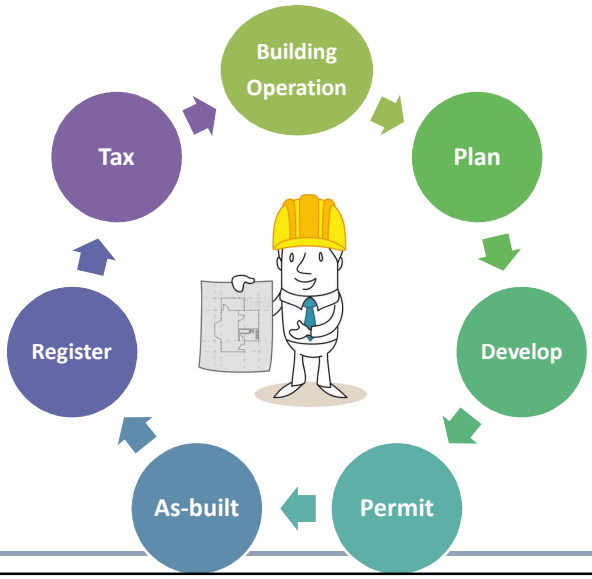
What is data lossless culture?

Every piece of data, creating by any professional is QC-ed, integrated and **stored in the national database**.



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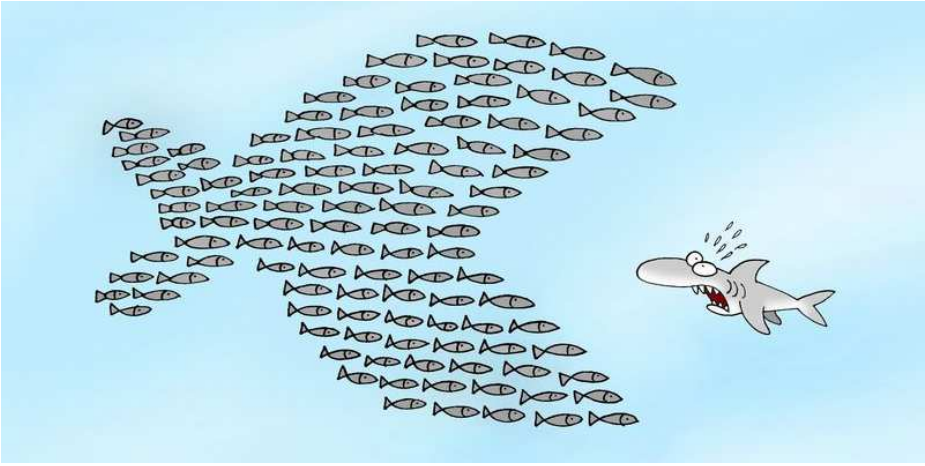
How to create a data lossless culture?

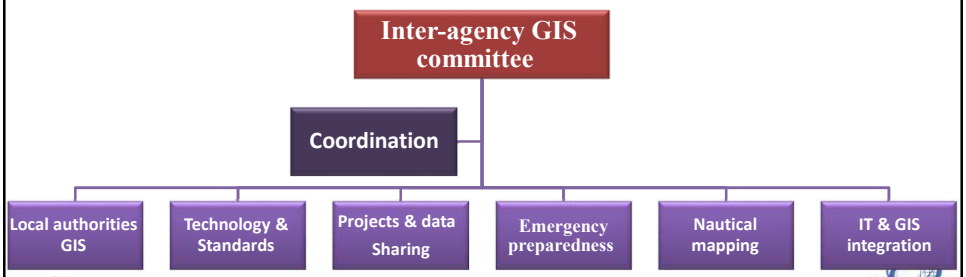
1. How to identify all the data generating parties?
2. How to convince organizations and people to share data? Despite the many barriers (legal, security, privacy, copyrights, tradition)
3. How to deal with different data format, structures and types which makes it hard to reuse data? Large amount of information unstructured.
4. How can we perform quality control on so many datasets?
5. How can we integrate all the data into a uniform database?

The power of collaboration



How to identify all the data generating parties?

- The inter-agency GIS committee was established in 1997 by a prime-minister order. It is Chaired by the SOI Director General.
- The committee has delegates from 45 governmental offices and 256 local authorities. This year the committee teams had 22 meetings with 176 participants.
- The key objective of the committee was to promote efficient use of GIS in the national level through data and knowledge sharing, and standards and working procedure development.



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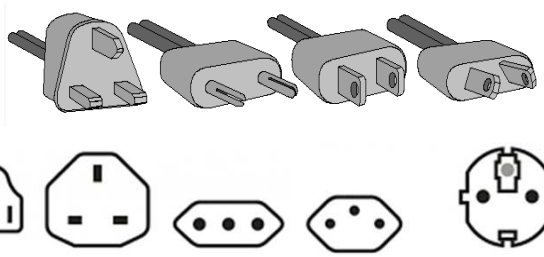
Why standards?

Standards that link hardware and software



Standards as a common language

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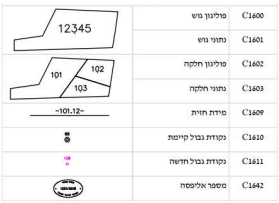
National mapping standard (published 2016)

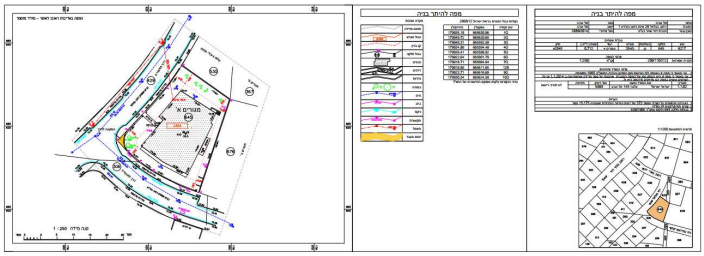
Define data format and layers



C1600	פוליגון גוש
C1601	נתוני גוש
C1602	פוליגון חלקה
C1603	נתוני חלקה
C1609	מידת חזית
C1610	נקודת גבול קיימת
C1611	נקודת גבול חדשה
C1642	מספר אליפסה

M4800	תוויית תיאור
M4801	קו ביוב תת קרקעי
M4802	קו סניקה
M4804	שוחת ביוב
M4805	משאבה
M4807	שסתום אויר/ נשם
M4819	כיוון זרימה
M4820	אגן חמצון
M4850	אביזר ביוב כללי
M4851	נתוני גובה במהלך קו ביוב

Define the content and the cartography



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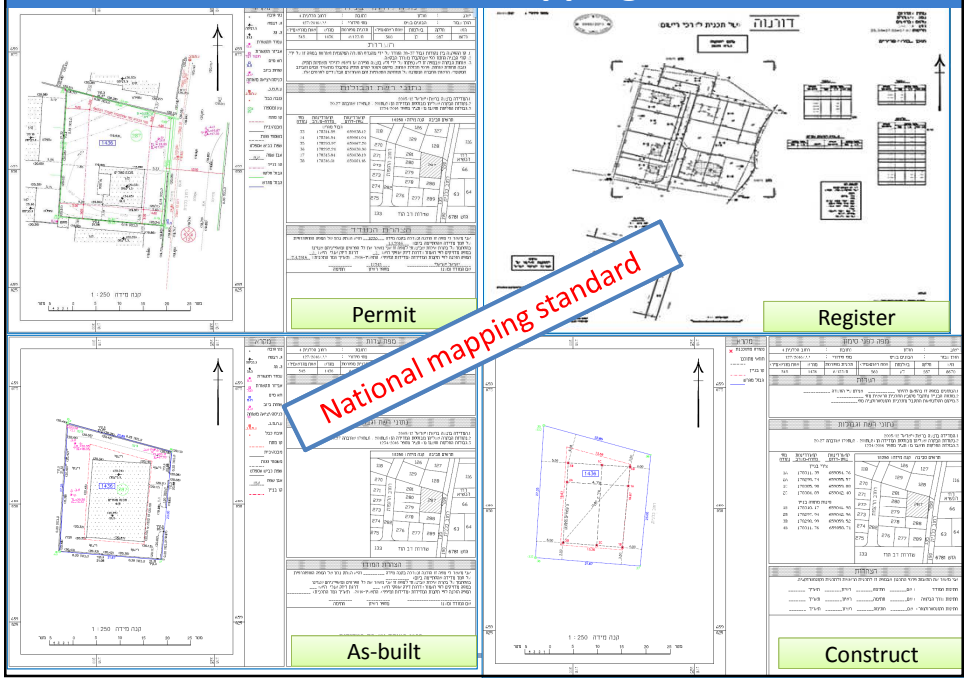
Uniform mapping



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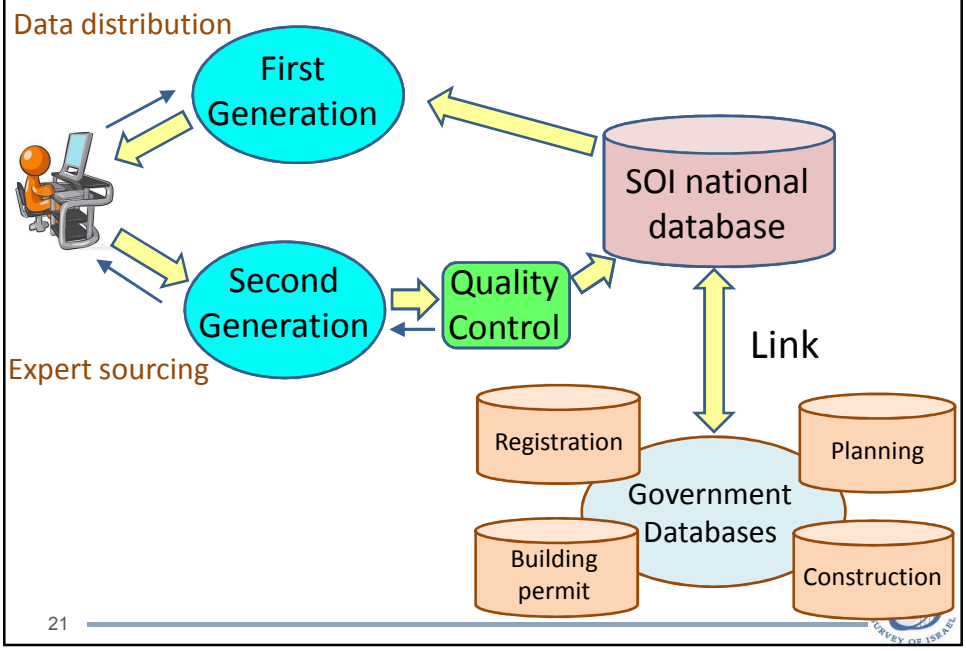
Topographical and Cadastral system development



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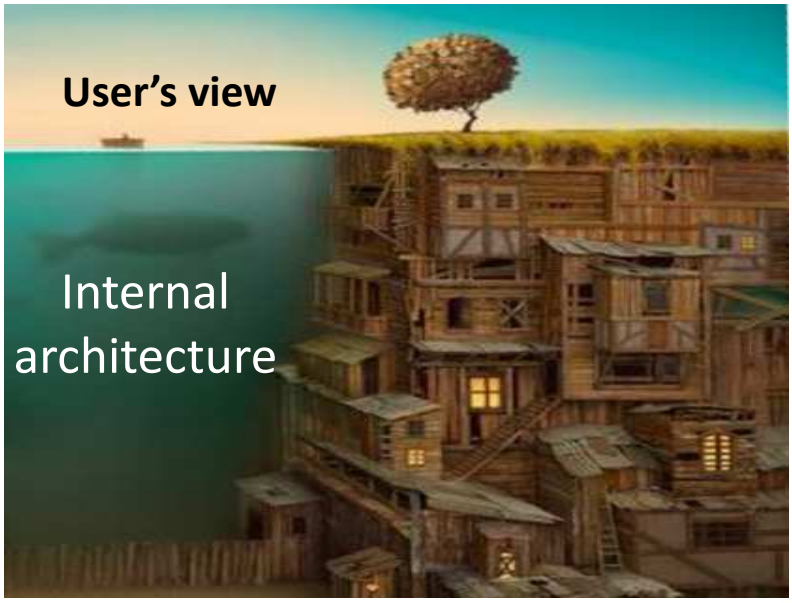
Simplicity – friendly user experience



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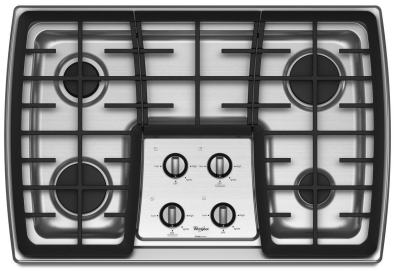
Simplicity – friendly user experience

Old design

Gas stove: 4 burners and 5 buttons



Modern design

No need for user manual or training

Rules:

1. No need for user manual or training
2. Smallest number of clicks (more is less)
3. Simple and fun to work with

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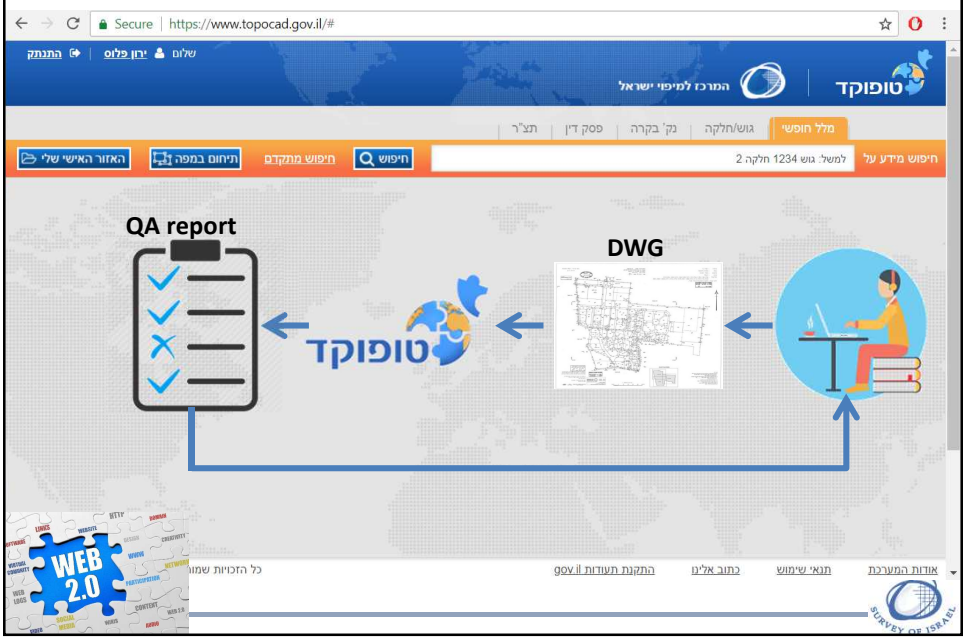
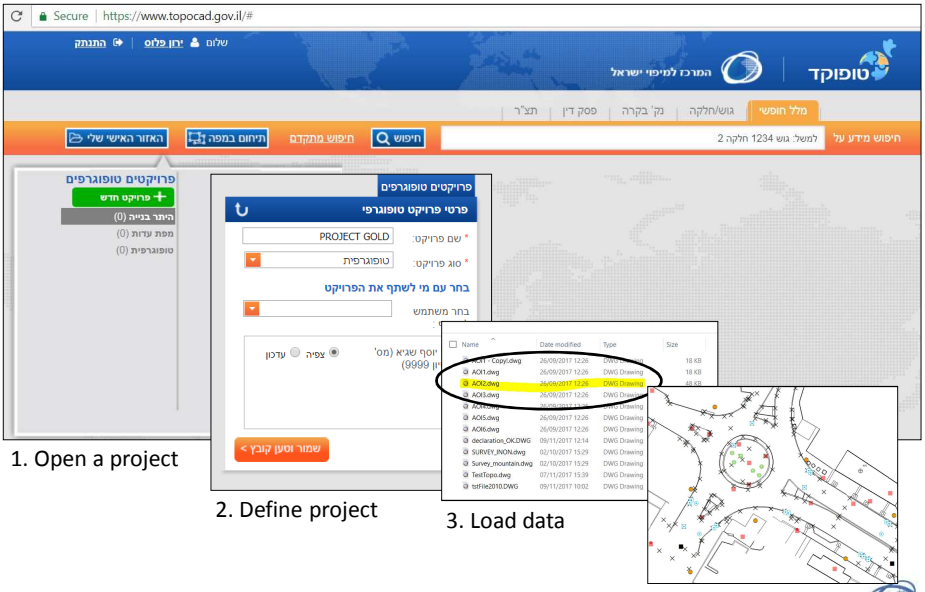
The TopoCad System



Online QC tool



1. Open a project
2. Define project
3. Load data
4. View QC results

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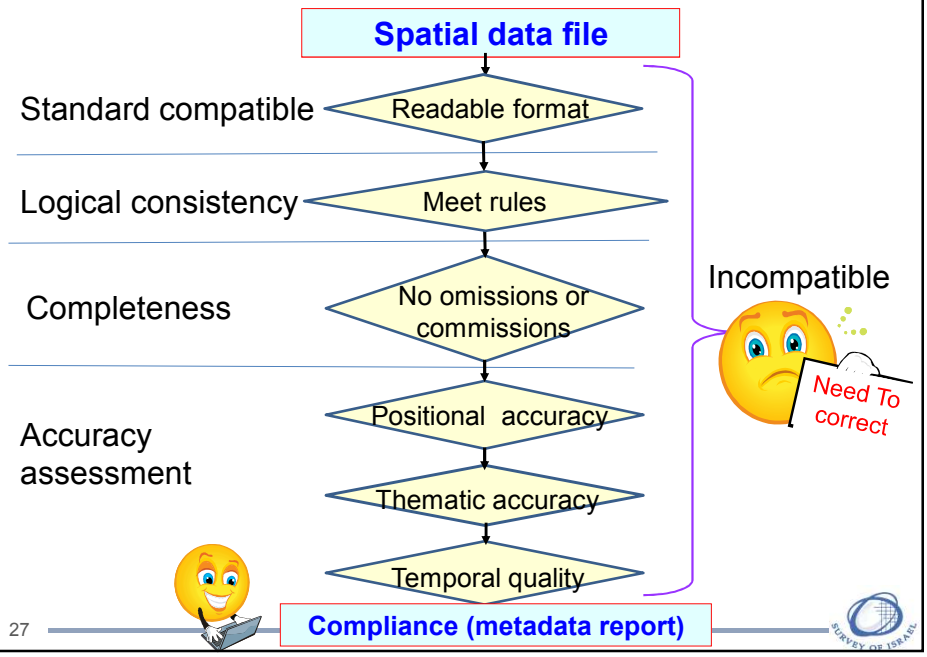
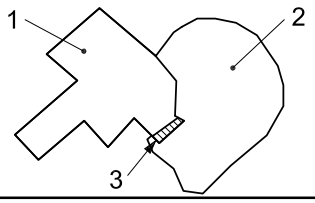
Quality Control Process (ISO 19157)



Logical consistency

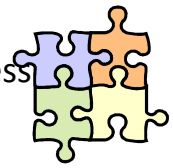
The program finds elements that do not conform to (logical) rules:

- Topology issues (Closed buildings – overshoots & undershoots)
- Topographic elements that appear in an incorrect layer (a road in a layer of buildings)
- Contour lines crossing each other
- A fence corner that appears inside a road
- Parcels overlapping each other (forming parcels smaller than 3 square meters)
- Duplicated lines



Completeness

- Completeness includes missing information (omissions) or information that appear in the file and not in reality (additions)
- The content of the map is defined in the specifications and match the map scale.
- Completeness test are performed interactively by overlaying the data file on top of a orthophotography at the proper scale.
- An error matrix is used to report of completeness



Commission

Omission

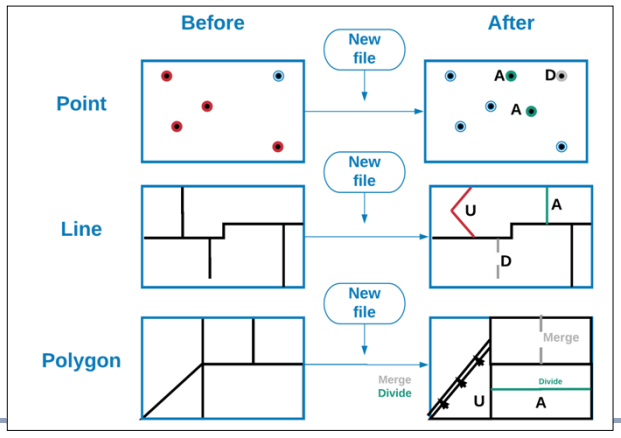
Thematic and positional accuracy

- Tests for thematic and positional accuracy are performed by field checking (of a sample) of objects in the map and comparing the field with the data on the map
- What is the attribute value (type of tree) in the map and what is the correct value in the field.
- Root mean squared error is used to evaluate the positional accuracy. It is calculated from the differences between a value in the map and an accurately measured position in the field.

$$RMSEx = \sqrt{\frac{\sum (dx_i)^2}{n_x}}$$

The data integration process (conflation)

- Data integration is a complex process which is currently done semi-automatically (interactively).
- The computer identifies features to Add, Delete and Updata
- A human operator has to approve the change.



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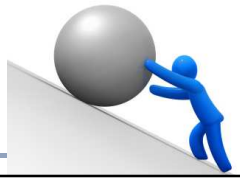
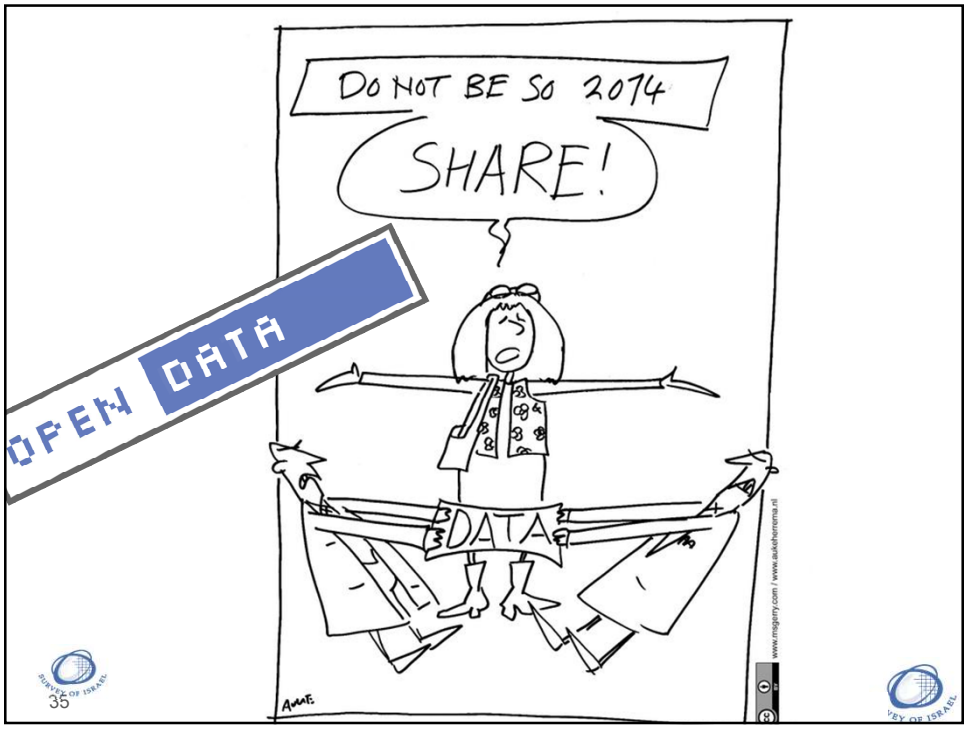
Summary

- Data is generated every steps of governmental and engineering activities
- Expert sourcing is the process of acquiring these data and making a useful database from it.
- We presented a working process.
- Some challenges that will be solved are:
  - A complete automatic process for the quality control and the conflation
  - Comprehensive treatment of the intellectual property rights



Thanks you


DO NOT BE SO 2014
SHARE!
OPEN DATA
DATA
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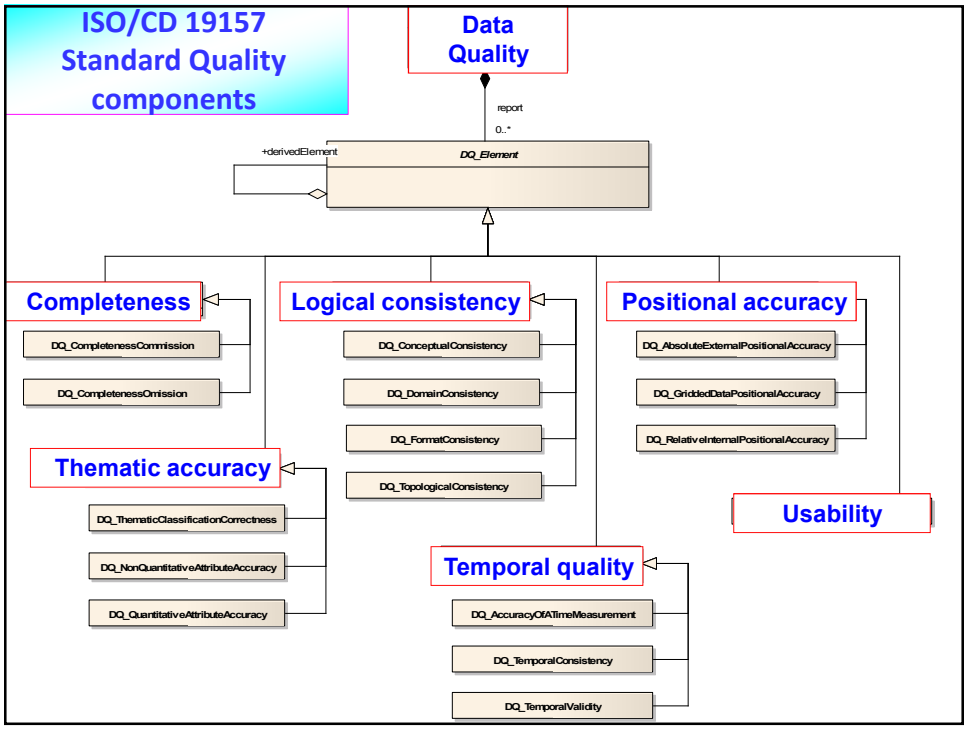
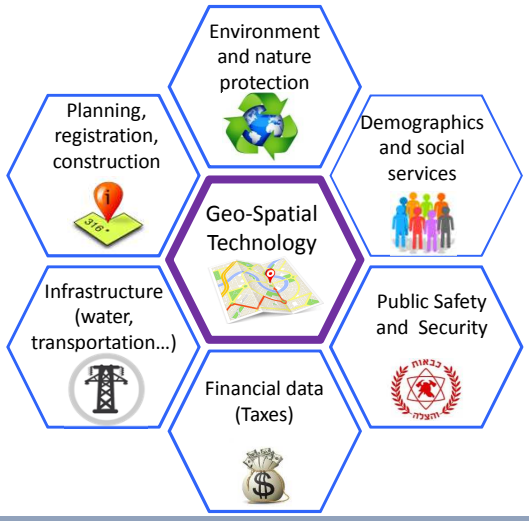

ISO/CD 19157
Standard Quality
components
Data
Quality
report
0..*
+derivedElement
DQ_Element
Completeness
DQ_CompletenessCommission
DQ_CompletenessOmission
Logical consistency
DQ_ConceptualConsistency
DQ_DomainConsistency
DQ_FormatConsistency
DQ_TopologicalConsistency
Positional accuracy
DQ_AbsoluteExternalPositionalAccuracy
DQ_GriddedDataPositionalAccuracy
DQ_RelativeInternalPositionalAccuracy
Thematic accuracy
DQ_ThematicClassificationCorrectness
DQ_NonQuantitativeAttributeAccuracy
DQ_QuantitativeAttributeAccuracy
Usability
Temporal quality
DQ_AccuracyOfATimeMeasurement
DQ_TemporalConsistency
DQ_TemporalValidity

Why Geo-spatial technologies?

Geo-spatial technology underpins smart nation operations



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