The Fourteenth International Conference on Advanced Geographic Information Systems, Applications, and Services
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A DEM Quality Dashboard

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June 29 - Porto, Portugal

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Professional Experience

- Professor of Cartography (Ujaen.es).
- Head of the Cartographic Engineering Research Group (Ujaen.es).
- Head of the Master's Degree of Science in Quality Assessment and Management of Geographical Information.
- International consultant.

Areas of interest & Publications

- Data quality (geospatial, metadata, linked data, etc.).
- Process control.
- Standardization in Geomatics.
- GIS & Remote Sensing.
- More than 100 publications in journals, conferences and book chapters.

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Professional Experience

- Associate Professor at University of Granada (Spain)
- Department of Architectural and Civil Engineering Graphic Expression
- Researcher in the Cartographic Engineering Research Group at University of Jaén (Spain)
- Researcher in Survey and Modelling Lab of Architectural Heritage at University of Granada (Spain)

Areas of interest & Publications

- Digital elevation models
- Cartographic Generalization
- Heritage digital documentation by Photogrammetry, scanner laser and survey
- Heritage building information modelling (HBIM)
- Virtual and augmented stereoscopic reality
- More than 70 manuscripts in journals, congresses and book chapters, 33 of them in JCR papers

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Professional Experience

- Associate Professor at Universidad de Jaén (Spain), Department of Ingeniería Cartográfica, Geodésica y Fotogrametría.
- Researcher in the Research Group Ingeniería Cartográfica.

Areas of interest & Publications

- Measurement uncertainty in surveying equipment.
- Cartographic generalization.
- Data quality on geographic information.
- More than 100 publications in journals, conferences and book chapters (17 JCR papers).

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Cartographic Engineering Research Group
TEP-164

Main research activities

- GIS: Applications to cartographic production, environment, resources and management.
- Cadaster and Valuation: Implementation of cadasters, valuation methodologies, large cadastral projects, LADM.
- Cartographic Production: Capture, generalization and integration of spatial data.
- Quality and standardization: Data quality, metadata and processes, BIM, standardization.
- Geodesy and Geophysics: Geoid and advanced GNSS processing.
- Photogrammetry and Remote Sensing: Applications to the environment, agriculture and engineering, heritage, etc.

On going projects:

- Functional Quality for DEM in Engineering 2020-2023. FJ. Ariza-López
- GRC-MS (Galileo Reference Center - Member States; International Consortium of 19 European partners, H2020 Project and € +1.67 M eligible costs): Work Package 3.5: OS Interoperability with other GNSS and Work Package 6: Scientific Support. J. Zurutuza
- GISCAD-OV (Galileo Improved Services for Cadastral Augmentation Development On-field Validation; 14 European partners, H2020 Project ID : 870231; Grant € 2.6M). J. Zurutuza
- JRC/IPR/2019/OP/2595 – Copernicus emergency management service (EMS) validation. TRACASA. F.J. Ariza-López
- Desarrollo del derrotero digital inteligente de las costas españolas (DDIE) M. Ureña

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Acknowledgment

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"Functional Quality of Digital Elevation Models in Engineering"

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PID2019-106195RB-I00/AEI/10.13039/501100011033
https://coello.ujaen.es/investigacion/web_giic/funquality4dem/

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What is a dashboard?

It is a visual analysis tool that uses data from various sources all on one screen that allows companies to track key performance metrics and optimize processes to achieve their goals.

https://www.idashboards.com/blog/2015/11/12/idashboards-launches-version-9-0-with-new-state-of-the-art-features/

https://www.esri.com/about/newsroom/arcnews/dashboards-give-geographic-perspective-to-coronavirus/

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The concept

A good dashboard design means:

- **Information available at the fingertip.**
- **Metrics are clear.**
- **Intuitive design.**
- **Customizable.**
- **Summarized data.**

0. Define a use case

The definition of the use case is critical in order to focus the development of the scorecard. Different use cases require different variables and representation methods.

1. Know your Audience

Great dashboard is created when you know the target audience. Dashboard view for the data producer perspective will be different from the user's point of view. Doing some user research will help us understand the users.

2. Choose the right kind for data visualization

Choosing the right kind of visual to showcase the data is very important for a well designed dashboard. A user-friendly dashboard design is needed.

3. Summarize data in 1 screen

Don't overload users with a lot of information (show summarized data and relevant data...).

4. Group related information together

Use the Gestalt Laws of Grouping (proximity, similarity, continuity, closure, connectedness, etc.).

5. Don't overdo with colors

It is important to stick to a few colors. Too many colors can overload the audience visually.

6. Create an intuitive layout

One of the dashboard design best practices is displaying the most significant data on the top part of the dashboard, important information in the middle, and basic or general details at the bottom.

7. Show the right context

Showing the right context in dashboard design is very important. Context is in the form of text including: labels, headers, Annotations, Legends, etc.

https://www.ideatheorem.com/insights/dashboard-design-guidelines-great-ux/

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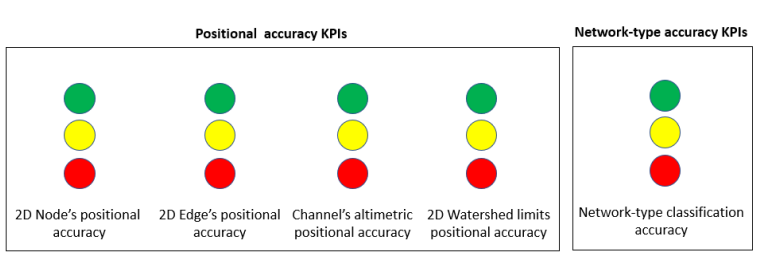
Example

Use case name	Determination of a drainage network
Abstract	The user wishes to generate a drainage network from a DEM data set.
Algorithm	{Single flow direction / multiple flow direction / Triangular form-based multiple flow / …}
Use	The result of the processing is a set of line strings defining the center of the main water courses that is used for hydraulic analysis.
Requirements	Fidelity of the results: • Positional accuracy of channels (line strings or edges). • Positional accuracy of nodes. • Altimetric accuracy of channels. • Completeness (omission and commission). • Topological errors. • Network-type classification. • … • Etc.



KPIs from a "fitness for use" perspective

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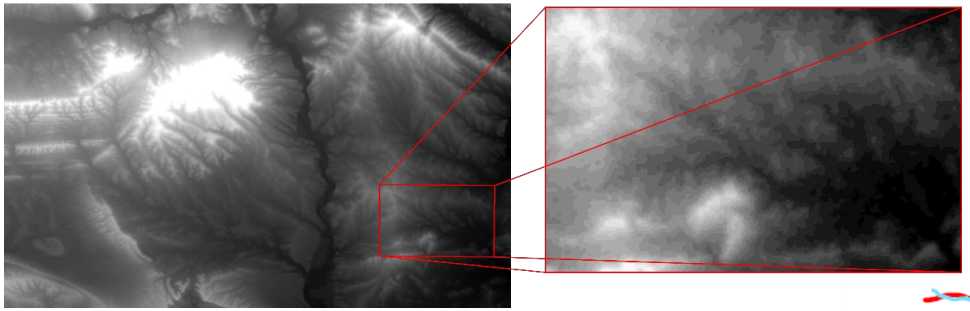
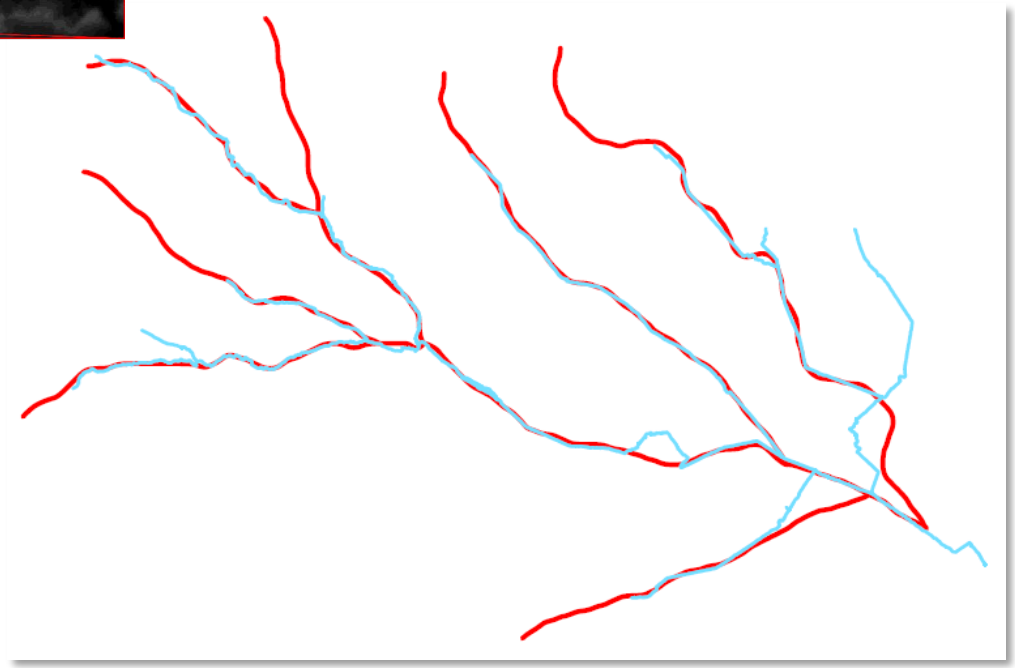
Example





Several possible KPIs:

- **Completion of nodes: omissions/commissions**
- **Completion channels: omissions / commissions**
- **2D positional accuracy of nodes**
- **2D positional accuracy of channels**
- **Altimetric accuracy of nodes**
- **Altimetric accuracy of channels**
- **Topology: hanging channels**
- **Topology: valence of nodes**
- **Geometric fidelity: Length of the channels**
- **Geometric fidelity: Shape of the channels**
- **Geometric fidelity: Network type classification**
- **Etc.**

Red: Data from the authoritative water agency
Blue: Network derived from the MDE02 by the IGN and D8 Algorithm

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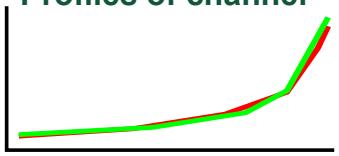
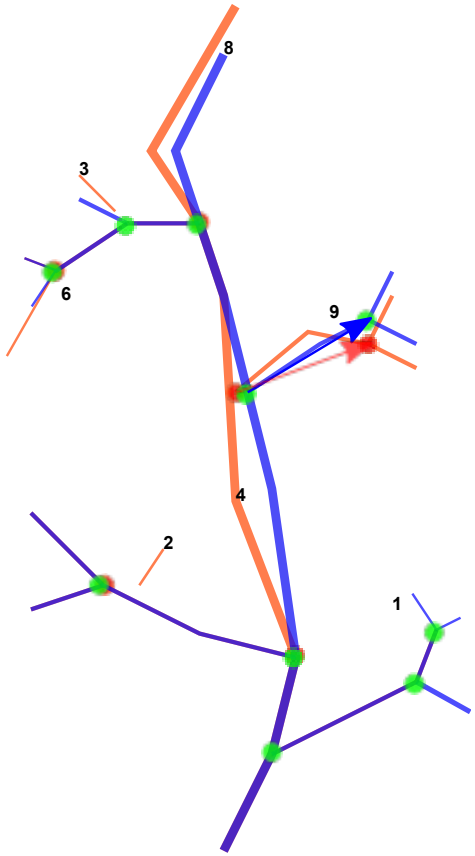
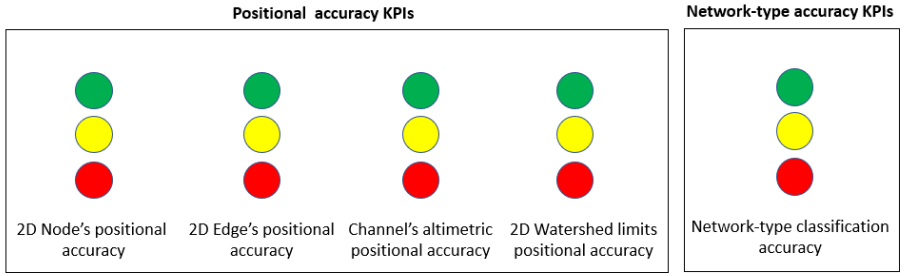
Example of graphical contents (approaches)

Profiles of channel



Strahler orders





SOI Topo sheet

SSRTM-GL1

AW3D30

GDEM-V2

CartoDEM- V3.1

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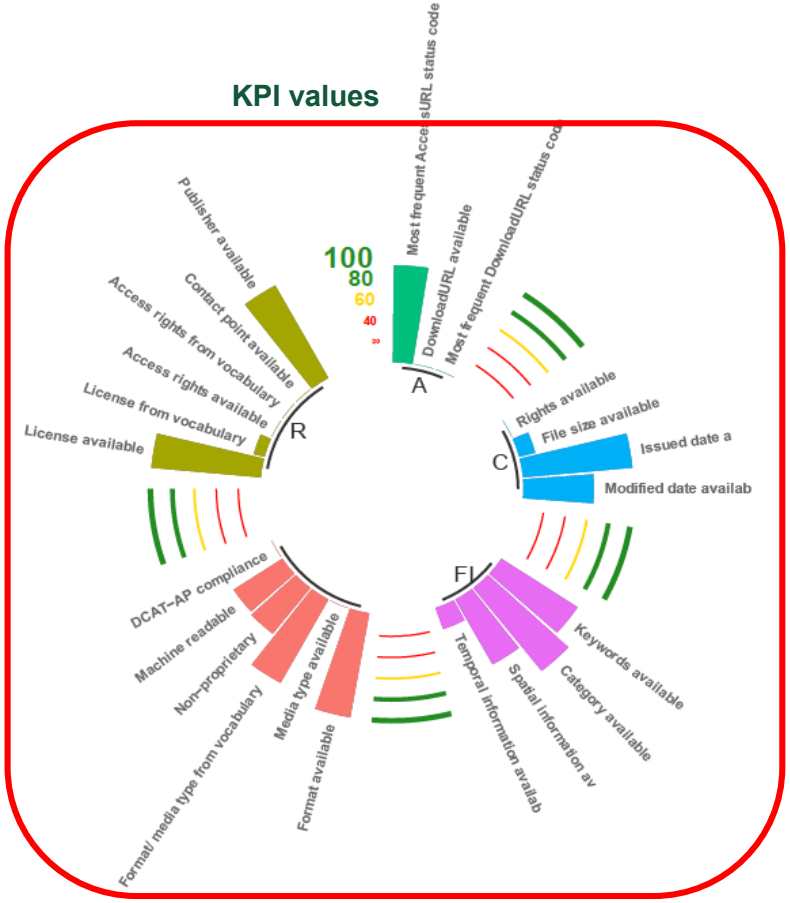
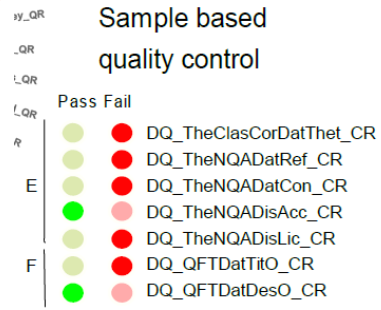
Example of structure

Metadata of the assessment

KPI values

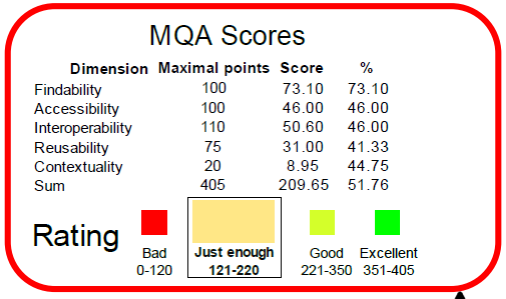


KPI acceptance rejection results



Legend

Final evaluation of the product



Quality of Metadata in Open Data Portals, IEEE Access, doi: 10.1109/ACCESS.2021.3073455

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Future steps

- Consult users to establish as many use cases as possible and in the best way.
- Consult users to establish the most appropriate requirements and measures (key performance indexes).
- **Analyze the possibility of generating a single index from the suggested measures to evaluate all requirements.**
- **Analyze different graphical options (stars, traffic lights, faces, icons, etc.) and the appropriate structure of the graphical tool.**
- **Consult users to establish the most appropriate graphical tools.**

If you want to participate in this process, please, send your suggestions to this email: fjariza@ujaen.es

Conclusion

- The main contribution of this work is to address a different way of expressing quality that can be better understood by DEM data users.
- Quality is linked to use cases in order to approach fitness for use.
- The use of a tool (dashboard) is proposed, which can range from something very simple to something complex and sophisticated.
- We request the help of users of DEM data to be able to move forward well oriented to propose this type of quality report.

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