

Towards a Guideline to Avoid Arbitrariness Between Structured Reports and Information Object Definitions

Thomas Trommer, Michael Gessat, Rafael Mayoral, Oliver Burgert
 Innovation Center Computer Assisted Surgery, University of Leipzig, Germany.

thomas.trommer@iccas.de

The DICOM Standard is facing challenges integrating new domains. Therefore, new use cases must be covered by DICOM, some of which can be specified as new modules and **Information Object Definitions** (IODs). Although it may be possible to realize those new use cases with the help of **Structured Reports** (SR). While most SRs deal with human readable information, it is possible and intended to use SRs for non human readable structured information, too [1]. Consequently, for many cases SR documents could be used instead of IODs. This leads to arbitrariness in the standard since authors can specify data objects in two nearly equivalent ways. Because of this, it seems necessary to propose a guideline to decide which alternative would be best for a given entity. This guideline would overcome the current situation of arbitrariness of this decision in the standardization process making the DICOM standard more coherent.

Methods

We have tried to reconstruct the criteria on which the decision between SR and IOD might have been based during the standardization process (Table 1). To maintain as much coherence as possible with existing IODs and SRs, we have developed a guideline based on those criteria.

IOD	Historical relation	Contains plain data	Convertible to text	Paper based predecessor	Summary of procedure
Any Image / Waveform		X			
RT Plan	X	X		X	
RT Beams Treatment Record	X			X	X
RT Brachy Treatment Record	X			X	X
RT Treatment Summary Record	X			X	X
RT Ion Beams Treatment Record	X			X	X
RT Ion Plan	X	X		X	
RT Structure Set	X	X			
Softcopy Presentation States		X			
Spatial Registration		(X)			
Deformable Spatial Registration		X			
Spatial Fiducials		X			
Real World Value Mapping		X			
Segmentation		X			
X-Ray Radiation Dose SR			X	X	
Mammography CAD SR			X	X	
Chest CAD SR			X	X	
Key Object Selection Document			X		
Procedure Log			X		X

Table 1: This table shows some IODs (red) and SRs (green) and their characteristic contents and usage used to find rules for the decision between IODs und SRs.

Results

At the moment, the standard contains IODs which could be SRs and vice versa.

The criteria derived from the current standard can help to make a clear decision on whether to use the IOD or SR concept for new supplements. We list the following rules that are consistent with the current standard:

- One reason for choosing SR or IOD is based on former developments in the standard. This means that if similar or related information objects are already IODs or SRs, then the new information object will also be coded as the same type.
- Not all contents can be conveyed usefully by an SR. If the information entity contains a huge amount of plain data (e.g. pixel values) it should be implemented as an IOD.
- If the information object is intended to be reused as part of another information object it should be an SR since IODs do not provide this functionality (Figure 1).
- If the information object should be easily converted to human readable text it should be an SR.

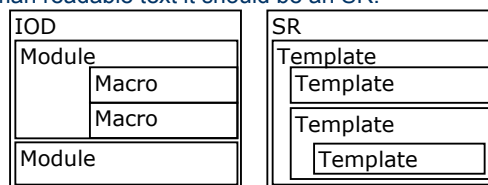


Figure 1: IODs have a strict 2-level structure with modules and macros. It is not possible that modules contain other modules. SRs have a multi-level structure where templates are nested into each other. Therefore, one has much more flexibility reusing templates for new information objects than reusing modules or macros.

Additional rules which may not be consistent with all IODs contained in the standard but might be applied to new work items are the following. These rules should be used only if no decision can be reached based on the rules above.

- Anything with a paper based predecessor should be an SR. This is necessary to preserve the possibility to run legacy workflows using the paper-based version.
- Information objects that summarize procedures or entire workflows should be SRs even if they are not intended to be read by humans.
- If there is a notable amount of human readable text, it should be an SR, perhaps using concepts such as "rendering intent" introduced by the Mammography CAD SR.
- If the decision between SR and IOD is still not clear using the above criteria, it is recommended to break the use case down into two parts, considering to create an IOD with the plain data and an SR with the human readable parts.

With our work we are attempting to give decision-making support to persons defining new DICOM features. It could initiate a discussion within WG06 on whether clear and unambiguous guidelines for the usage of IODs or SRs can be given.

[1] Clunie, David A.: DICOM Structured Reporting. Bangor, Pennsylvania: PixelMed Publishing, 2000.

Contact:

Dr. Oliver Burgert
 Semmelweisstraße 14
 04103 – Leipzig, Germany
 Phone: 00493419712000
 Fax: 00493419712009

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