**Digital transformation of engineering exchanges between a customer and a supplier**

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**Abstract**

Digital transformation is the today ultimate buzzword in companies. Behind all this buzz, there are deep and major on-going transformations both on the products and services we deliver to customers and on the way we work. This paper aims to present on-going activities performed in cooperation between CNES and Thales Alenia Space on the transformation of the relations between a customer and a supplier, thanks to digital technologies, in particular in the exchange of engineering information.

Deployment of digital engineering is on-going both at customer and supplier levels, many initiatives permit to deploy model based approaches and digital continuity, the current trend being to move applicability from some engineering silo to the complete life cycle from early conception to operational usage. These transformation brings already tangible benefits but most of them limit the digital continuity to the doors of each company. Communication between actors (customers, primes and suppliers) in vast majority fall back to a paper based approach or its modern version : a pdf based approach. This break in digital chain lead to a non-optimised process where the transformation forth and back from digital to paper and from paper to digital is costly(on both sides, to produce the documents at supplier level and to process, review and integrate them at customer level), and have impact on agility (documents are issued at discrete times for reviews) and our capability to ensure consistency of the data to master increasing system complexity.

Three years ago, CNES and Thales Alenia Space lauched an R&T activity to redefine this communication and move from a paper based approach to a digitally continuous approach.

We perform a systematic and pragmatic approach, by combining study of existing communications on real projects (for example review data packages) in a bottom-up approach and by interviewing several users (from CNES and Thales Alenia Space) and making surveys in a top-down approach. We end-up with a cartography of the most promising exchanges to be improved by digital continuity, refined needs, and many questions to be answered during the study. On top of the technical challenges, moving from current practices to digital approaches raise a lot of issues for example on contractual aspects (what is now a deliverable), on data retention (how many time I will be able to access to the data), on data modification (how to prevent data modification once baselined) and others that does not appear on the paper based approach and that have to be addressed by a digital solution.

We define a software architecture that is capable to implements these digital exchanges and all the capabilities required to do this. For example : the capability to source the data in the currently used engineering tools, link and navigate data, link and navigate documents content that are not currently fully digitalised but also a the capability to assist the reviewer by AI algorithms and enhanced data visualisation technologies.

We then prototype a implementation of digital exchanges focused on the review capability for the customer. We select some review domains, first requirements domain then FDIR (Failure Detection and Isolation Recovery) design and we demonstrate the suitability of the software architecture.

Delivering digital data has value for the customer only if we achieve a certain level of interoperability in order to facilitate integration of this data in their own process. All this work obviously linked with on-going European Osmose initiative aiming to define a shared ontology of engineering data between the space actors.

The paper will detail all these points and will present the prototype developed during the activity.

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