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Uniform, multi-landscape technology-independence and interoperability in the HL7 development paradigm

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Information technology services and allied infrastructure have become a veritable fixture in healthcare provider facilities worldwide. Cutting-edge, superlative, smart computer systems have been complemented with commensurate regulation and standardization processes, across geographical and socio-economic boundaries, maximizing the Return-On-Investment (ROI) from such ventures. Semantic Interoperability (SI) which is the meaningful exchange of healthcare information with homogenous understanding amongst participating enterprises, is therefore the key. Extrapolated to a universal sense, it is termed herein as International Interoperability. Health Level Seven (HL7) v3 is a global healthcare standard which supports SI. It consists of an upper ontology, Reference Information Model (RIM), and the three paradigms of messages, Clinical Document Architecture (CDA), and services. The upper ontology consisting of functionally-diverse sub-ontologies, is HL7's foundational structure. The RIM is the encyclopedic reference for the vocabulary schema in all HL7 implementations. The current manifestation v3 of HL7 however, is difficult to implement and maintain. Core design and operational issues have arisen from the newly-inserted RIM. These logical and ontological flaws have affected efficient, compliant system implementations. Poor-calibre finalized specifications have led to difficult system implementations. Compounding the problem is the non-uniformity in the modelling vocabulary. The upper ontology is represented in Web Ontology Language (OWL), whilst the RIM and the three paradigms are modelled using the Extended Markup Language (XML). This multiplicity, non-uniformity, and wordiness in representation of linked phases of the development process results in a segmented vocabulary universe, requiring translation at the various interfaces. Inter-phase interoperability, stakeholder communication, quality of specifications generation, and overall development efficiency are all affected. The principle objective of this research therefore was to infuse overarching uniformity and brevity in the utilized vocabulary, extending across multiple developmental landscapes. Our proposed solution remodels all OWL and XML artifacts using the proposed, techno-platform independent Unified Data Atom (UDA+) representation, either first-hand or as a single-step transliteration, creating overarching homogeneity across all five HL7 landscapes. The UDA+-modelled artifacts achieve true inter-phase interoperability promoting high-quality specifications development. They exhibit simplicity, brevity, and versatility over the previous representations. Principally significant is that analysis and design interoperability amongst all stakeholders also derived actualizing overarching, ubiquitous exchange.

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