Comparison of Conventional Platforms with the I-A Platform

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Basis for Comparison		Type of Platform[1]		Advantages/***Disadvantages*** of the I-A Platform
		Conventional[2]	I-A Platform	
General	What can be stored	Each platform is limited to a given type of information by its externally specified data storage structure	Any type of information	Platform is universal
	Analogues	How we communicate among ourselves	How we comprehend the world	Consistent with human thought
	State of development	Highly developed with large base of expertise	Proof of concept only; no development or base of expertise	***No application yet available***
	Security	Complexity and multiplicity of software languages allows for many avenues of attack; software can't be readily analyzed hazards	Constraints and processes stored as elements minimizes avenues of attack; all logic can be analyzed and hazards detected or directly blocked	Better security
	Technical fields of study	Various somewhat independent fields of study, primarily engineering, e.g., hardware, software development and computation	One field of study: Information	Common framework for all information-related fields study
	Platform complexity	Each platform is relatively complex but in different ways	The least-complex platform based on first principles	Less to learn; knowledge is transportable

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Fundamentals	Theoretical foundation	Ad hoc; some portions are described by mathematics but not as a constraint	Based on a theory of stored information that cannot be overridden	Based on and always consistent with a theoretical foundation
	Resolution (abstraction)	Varying levels of resolution hide the atomic elements of the information; differing abstractions result in incompatibilities	Information is stored in the most resolved form (i.e., atomic elements) so that all information is at the same level of resolution	Greater generality and less ambiguity
	Storage of data elements and data storage structure	Separated (structure externally specified in schema, file formats, documentation, etc.)	Integrated and inseparable	One framework for managing all information
	Completeness of information stored	Some information is stored externally or rely on the users knowledge to "fill in the blanks"	Everything can and must be specified	No missing information
	Specification of application logic (constraints and processes)	Software specifying a sequence of instructions	Elements specify application logic; constraints and processes are fully resolved and independent thus there is no specified sequence	Directly implementable in a parallel processing environment
	Speed	Maximized by external storage and conventions implying structure	Depends on implementation	***Unknown***
	Storage requirements	Minimized by external storage and conventions implying structure	All structure is stored rather than implied or externally specified	***Requires more storage***
	Duplicates	Generally not allowed	Allowed with its context specified, including "possible duplicates"	Allows specification of more complex information and simplifies merging of platforms
	Extraneous information	Data storage structures may specify information that has no correspondence to the subject matter (e.g., column order)	Nothing extraneous is specified	Absence of extraneous information

Basis for Comparison		Type of Platform[1]		Advantages/***Disadvantages*** of the I-A Platform
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Information Sharing	Consistency among different application	Little or none	Only one way to store a given set of information	Consistency across all applications
	Merging information in different platforms	Difficult; information is often lost	Trivial; no information is lost	Merging information is simple
	Handling queries across platforms	Internet browsers only access site-specific text; complex queries require gathering, converting and merging information from multiple platforms before running a query	One query can be written to simultaneously access and merge any form of information on multiple platforms and present the query results	Greatly simplifies complex querying across multiple platforms
	Internet access to quantitative information	None or limited availability at a site; can't query across multiple sites	See above	See above
	Linguistics	No correspondence	Stored element subtypes correspond to linguistic elements	Consistency with linguistics
	Terminology	No standard or consistent terminology across the fields of information, and sometimes even within a field	Consistent terminology was developed to identify the types and elements of information	Provides a foundation for unambiguous terminology

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Quantitative Data	Resolution of quantitative information	Level of resolution is the same as basic mathematics; each field stores a constant or variable	Specified at the lowest level of resolution; stores components of a constant or variable	More robust handling of quantitative information
	Number handling	Stored as either a signed fixed length floating point or signed fixed length fixed point; some exact fractions cannot be stored exactly	Sign and count stored as separate attributes; a count is either a variable length natural number without a maximum or a ratio of two natural numbers	More robust and more accurate number specification
	Number uncertainty	Ignored or stored with difficulty; often implied or ambiguous	Can and must be specified, either exact or within an uncertainty range	Unambiguous specification of number uncertainty ***Uncertainty information is often not available***
	Rational number precision	Fixed precision is implied by format (e.g., $0.01); variable precision is not directly or easily specified	Can and must be specified	Unambiguous specification of number precision ***Precision information often not available***
	Units of measure	Generally implied; usually only one unit of measure is applicable to a quantity	Can and must be specified; any applicable unit of measure can be specified including mixed units of measure, e.g., 4'-8½"	More robust quantity specification; able to store data as collected or reported w/o conversion; output preferred units regardless of what is stored
	Division by zero	Results in an error	Zero is treated in a manner that eliminates the underlying cause	Division by zero cannot occur

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System Design	Application development in general	Ad hoc design and development	Use applicable portions of a pre-specified general ontology composed of a concept taxonomy, processes and constraints	Faster and simpler application development
	Application development rigor	Methods and tools facilitate ad hoc development	Math-like rigor	Consistency across all applications
	Taxonomy of concepts (classifiers of instances)	Concepts are table names and column names; a concept taxonomy is usually a stand-along application	A concept taxonomy (of any complexity) is independent of instances	Concept taxonomy is stored and used in an application
	Data modeling and ontology development	Data models and ontologies (concept taxonomy and constraints) are design tools	Data models and ontologies are stored in the platform and are integral to the application	Design and implementation are integrated
	Display conventions/formats	Display conventions/formats are often used as the basis for storage (e.g., a floating point numbers and date/time)	Storage is independent of a display convention or format; display is determined by the interface	Input and output can be in any format
	Business rules	Business rules describing constraints and processes are requirement specifications used in development	Business rules are directly convertible to constraints and processes, and vice versa	Business rules and constraints/processes are directly linked
	Screen design	Ad hoc	Basic screen components are elements in the ontology	Faster and simpler screen design
	Database Normalization	At the discretion of the developer	Attribute information always in normal form	Consistency across all applications

[1]A platform is an information storage device plus the means of accessing & altering its content (e.g., an operating system and applications)
[2]See"Data and Reality" by William Kent, 1stBooks, 1998, ISBN 1-58500-970-9, for an excellent discussion of the problems with conventional platforms