

# HumanML: the Vision

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## Introduction

The ability to leverage open-standards to improve communications between human-to-human, human-to-machine, and machine-to-machine is becoming crucial to both the public and private sectors. An exploding volume of information surges like a deluge across a world of ubiquitous networked computing. In such a world, how can drawing upon the appropriate information and knowledge be facilitated in a timely manner? After all, the ultimate purpose is for humans to interact. People want to share their thinking, coordinate, work together to accomplish things, leave a legacy of knowledge and wisdom gained, entertain each other, and socialize. Information Technology (IT) that mankind devises is merely means to accomplish that.

Human Markup Language (HumanML) is one possible technology for addressing some of these critical aspects of communication. This report is intended to expound upon a vision for how HumanML may play a role in doing so and how it may be applied in the government and private sectors to improve overall collaboration. Focusing on what functional niches HumanML may fill, this article will hopefully provide context of vision for those already steeped in advancing IT state of the art and are already well versed in the underlying foundations, upon which HumanML is being constructed. At the same time, the hope is to provide just enough of a high-level glimpse beyond that vision into the underlying technological context so that others not so well versed may gain sufficient understanding to appreciate how HumanML may play a role in addressing the issues alluded to above.

Some of the questions that the use of HumanML could hopefully address are: Is the retrieved document informational in nature? Is it intended as policy, as advertisement, propaganda, or some other purpose? At the point in history of document creation, what was the unstated motivation to create & publish it? What was the author's attitude toward the subject? When extracting or quoting short sections for citation or comment, how can this context be carried forward without the need to include long background passages? How to avoid accidental release of protected information by ignoring or forgetting to include external markings? How to avoid distortion of original meaning or intent whether intentional or not? How to understand cross-culturally and interpret specialized lingo such as "governmentese" in current layman's terms and in the current context?

Beyond creating broader appreciation for what it can provide, the intended impact of this article is draw others into the processes developing and supporting HumanML that will help move it forward as a recognized & implemented global standard.

## What is HumanML - How Did We Get Here?

HumanML is a new specification being developed by the Organization for the Advancement of Structured Information Standards (OASIS).<sup>1</sup> Work on HumanML migrated to a Technical Committee of OASIS after initially beginning independently in an ad hoc Yahoo Groups mailing list. Evolved from the informal practice of using emoticons – ☺ – to improve communication in a world of text-based e-mail, newsgroups, and chat rooms, HumanML is aimed toward a more formal representation of human characteristics (e.g., cultural, physical, psychological, etc.). It is focused on enhancing the fidelity of human communication by providing machine processable subtext through the use of **eXtensible Markup Language (XML)**.<sup>2</sup> As such, the markup artifacts are buried within the digital document and normally hidden from view much as markup for web (HTML) documents or those of other applications (e.g.: .doc, .ppt, .xls, .pdf, .odt, etc.).

## HumanML and the Future of Collaboration

While the goal of HumanML may seem somewhat ambitious, the vision is very well timed for the dramatic changes currently taking place such as explosive Internet growth in the non-Western world. During the next fifteen years accurate information exchange between people of unlike cultures and origins is expected to be an ever-increasing concern with respect to Internet and other digital means of communication. Accordingly, there is a clear need for emerging technologies that will improve global communication to address the higher level of global interconnectedness.

HumanML is focused precisely on facilitating the key human abilities needed to deal with the challenges brought on by the times – to share, collaborate, and relate. As an open standard, HumanML is aimed at helping to sort through mountains of textual and multi-media material by providing for inclusion of human related contextual clues such as the authors' and publishers' intent in the form of standardized document markup.

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<sup>1</sup> The OASIS consortium (<http://www.oasis-open.org>) is primarily an industry-based organization of member companies whose sponsoring dues pay for the organization's operations – a not-for-profit consortium that advances electronic business by promoting open, collaborative development of interoperability specifications

<sup>2</sup> Being developed as a standard under the World Wide Web Consortium (<http://www.w3.org/XML/>), XML has become globally accepted for digital document markup. It is coming to serve as foundational for all digital document markup including HTML, more advanced desktop applications, and Semantic Web technology (mentioned later in this article). U.S.Federal government efforts to bring XML technology to bear are summarized at URL: <http://xml.gov/>

Providing a standardized means to convey and establish contextual meaning is intended to allow authors a chance to rise above the chaos described below and permit researchers more opportunity to timely pull valuable nuggets of information and knowledge out of that same chaos. Another goal of HumanML is also to provide document markup standards that permit adjustment of the **Human Computer Interface (HCI)** to the system users' most effective modality. Additionally, HumanML provided standardized markup could facilitate automated handling and management processes that account for information protection and releasability of at any level of granularity.

## The Curse Comes True?

Perhaps it could be said that we are living out the ancient curse: “May you live in interesting times.” Civilization has largely crossed the boundary from the industrial age into the information age and is already moving beyond into an age governed by a **Knowledge Economy**. The transition has thrust “interesting times” upon us. We are struggling to cope with the chaos of an explosive growth in the flux of information and novelty that is increasingly difficult to ignore. We need to deal with an ever-increasing pervasive nature of change where our privacy and personal time is ever more challenged. We can try to run from it, but places to hide are disappearing where we might escape from an onslaught represented by **Variety, Volume, and Velocity (V<sup>3</sup>)** of information and change.

John Sealy Brown, former director of the Xerox Palo Alto Research Center (PARC), has identified a convergence of factors contributing to the explosive change we are witnessing.<sup>3</sup> He sees a “fundamental dynamics” formula that expresses the rate of change where exponential growth factors act as multipliers. The widely known Moore’s law – the number of devices on a computer chip, and hence its computing capacity, doubles every 18 months – has remained valid over the last forty years and appears destined to remain valid into the foreseeable future. A second factor, the carrying capacity of optical fiber strung across the planet, has been doubling every six months. This is the result of fiber being laid over the face of the Earth at an overall rate faster than the speed of sound (700 feet per second – 24 hours a day, 365 days a year) coupled with increasing bandwidth capacity, which has increased 200% over the last decade.<sup>4</sup> A third factor is increasing capacity of storage technology where capacity doubles each year per cost unit. Metcalf’s law governs the fourth factor – the power of networks increases where the number of nodes acts as a power of two; i.e. thrice the nodes, nine times the power. As a result, the more people who can interact in communities enabled by the Internet, the richer and more voluminous the content and flow of information – **V<sup>3</sup>** again as the number of users on the Internet continues to increase exponentially.

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<sup>3</sup> See his “Scientist's Perspective” presentation from the 2001 Storytelling event at the Smithsonian at URL <http://www.creatingthe21stcentury.org/JSB2-pace-change.html>

<sup>4</sup> See “A Brief History of Fiber Optic Technology” at URL: <http://www.fiber-optics.info/fiber-history.htm> for further information.

Old paradigms for understanding and communicating no longer seem to serve us well and actually hinder our ability to cope. Somehow we need to find a balance between a state of being computer illiterate – viewing technology as a toy or passing fad – and a state of being unable to get through any hour of the day without worshipping at the alter of instantaneous connectivity: on the web, on the mobile phone, instant messaging, 24-hour news broadcast, TV never out of sight.

In works published across the last three decades of the twentieth century, the futurists Alvin and Heidi Toffler foretold how migration to an information age would force change on human culture.<sup>5</sup> Picking up on this theme shortly before the turn of this millennium, Stan Davis and Christopher Meyer identified a developing “Blur” brought about by a synergism between increasing connectivity, speed, and intangible value.<sup>6</sup> The latter – in the form of information, know how, and relationships – increasingly represent real economic value that challenges and blurs old thinking concepts. In a Knowledge Economy the real medium of exchange and measure of value is information and knowledge – the “Silver” and “Gold” of our time. Physical capital – the traditional measure of economic strength – is coming to represent more a liability than an asset. Physical things are limited resources, leading to “rice bowl” mentality – sharing with others divides and dilutes value. On the other hand, information and knowledge increase in value by sharing – they are replicable. But information and knowledge have a half life – their value decreases over time and with lack of use – hence the pressure to increase the speed, with which they flow and are distributed. The measure of their value is in how people carry and make use of them. Additionally, understanding and wisdom – the “Platinum” of our time – generally remains tacit, i.e. quietly residing in peoples’ heads. Due to these human factors, modern management circles are struggling to come to grips with “Human Capital” as a concept. Willingness to share as well as receive knowledge, information, understanding, and wisdom depends on human relationships built on trust and reputation built and stored up over time. As J.S.Brown’s “Fundamental Dynamics” formula cited above would indicate, the ease of associating with others via the Internet is a force for change in the whole nature of work and collaboration. Supporting mankind’s ability to cope with this tectonic shift, HumanML is focused precisely on facilitating the sharing of information, knowledge, understanding, and wisdom as well as in building and maintaining relationships.

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<sup>5</sup> The Tofflers’ core works are “Future Shock” (1970), “The Third Wave” (1980), and “Power Shift” (1990); their other works elaborate and expand on this theme.

<sup>6</sup> “BLUR, The Speed of Change in the Connected Economy” Stan Davis and Christopher Meyer, Ernst & Young LLP, Warner Books: New York, 1998

## Water, Water Everywhere; But Not a Drop to Drink

Survivors adrift in a raft on the ocean need fresh water to avoid dying of dehydration. Trying to drink the ocean's salt water in desperation simply worsens their plight, rapidly spiraling toward death. Similarly, with coming ubiquity of broadband connectivity to the Internet, ever more people are being set adrift on a globally interconnected sea of information not only to partake but also to contribute. We are coming to a state where we're drowning in information (salt water), but starving for the right knowledge (fresh water). Akin to the way salt water overloads the limited human body's capacity to process unneeded elements out of the water, information overload wreaks havoc with the human mind's capacity to focus attention.

In a knowledge economy, the key Knowledge Management principle is for the "right information and knowledge to get to the right person at the right time" when it's needed to meet that person's immediate needs. Pushing unneeded information at people when they have no immediate use for it is bothersome at best – witness how well junk mail, ill-timed sales calls, and SPAM e-mail are appreciated. On the pull side, fishing for the right information and knowledge on that global sea is just as problematic. Beyond this, out of date, inaccurate, poorly organized, unfocused, or ambiguous information can prove deadly in critical situations. NATO's 1999 bombing of the Chinese Embassy in Belgrade<sup>7</sup> might serve as an example of the former. The Charge of the Light Brigade<sup>8</sup> and the circumstances surrounding the attack on Pearl Harbor<sup>9</sup> might serve as witnesses of the latter.

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<sup>7</sup> The maps used to locate the intended target were at least four years out of date, ref: <http://www.cnn.com/WORLD/europe/9905/10/kosovo.01/>

<sup>8</sup> British army commander Lord Raglan's written order on 25 October 1854 for "the cavalry to advance rapidly to the front and to prevent the enemy carrying away the guns" left it unclear as to which guns. Verbal explanation by the courier, Captain Nolan failed to clarify. As a result, rather than advancing to prevent take over of their own artillery positions – that they **could not see** – on the back side of the Causeway Heights, more than 600 men charged toward enemy positions down a valley – that they **could see** – between Causeway Heights and Fediukhine Heights only to be slaughtered by Russian artillery shooting down at them from all sides.

<sup>9</sup> General Marshall's telegram reached the military commanders in Hawaii hours after the attack commenced thereby resolving any ambiguity evident in it's indication that the "JAPANESE ARE PRESENTING AT ONE PM EASTERN STANDARD TIME TODAY WHAT AMOUNTS TO AN ULTIMATUM ALSO THEY ARE UNDER ORDERS TO DESTROY THEIR CODE MACHINE IMMEDIATELY STOP JUST WHAT SIGNIFICANCE THE HOUR SET MAY HAVE WE DO NOT KNOW BUT BE ON ALERT ACCORDINGLY STOP"

Technological solutions are evolving to help deal with these issues. Dictionaries – a five-century old technology – provide various entries for meaning of words depending on their context. Thesaurus technology along with other cataloging, indexing, and classification techniques developed over the years also aid in clustering words and documents around etymological concepts. These technologies have migrated forward from the world of hard copy documents and prove useful, but are limited in dealing with the “Info Glut” explosion of a globally interconnected world. And beyond etymological meaning of words that dictionaries and related technologies provide is semantic meaning of words in their context – something addressed by **Natural Language Processing (NLP)** technology and the **Semantic Web**, which are just now beginning to emerge from the domain of cutting edge research. It is in this environment that HumanML is to find its niche.

The blossoming of the Semantic Web idea could be dated to a seminal article in Scientific American magazine published in May 2001.<sup>10</sup> With the current pursuit to develop it in mid-2005, the Semantic Web is in the early stages of becoming a reality in the public Internet domain – for now largely at an experimental level. As envisioned, the Semantic Web would go well beyond existing search engine technologies, which are blind to semantic context. In mid-2005, a search produces pointers to multitudes of documents, many of which have nothing to do with the intent of the search. Mathematical clustering of documents<sup>11</sup> based on their content can significantly improve on getting closer to similar context across a group of documents. NLP can enhance both clustering as well as searching and summarizing.<sup>12</sup>

Yet in their well-intentioned attempts to communicate, document creators are still left to cast their message in a bottle (their carefully crafted document) out onto the globally expanding sea of data and information – their hope being that it will be caught in the search-engine fishnet of someone seeking just that information. Else that it will drift up onto a shore where an interested beachcomber (person browsing or software agent

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<sup>10</sup> "The Semantic Web" By Tim Berners-Lee, James Hendler and Ora Lassila, Scientific American, May 17, 2001 (<http://www.sciam.com/article.cfm?articleID=00048144-10D2-1C70-84A9809EC588EF21>). This article popularized earlier work by Tim Berners-Lee and others working largely in a relatively closed community (a natural information silo due to its technical focus) and points back to "*Weaving the Web: The Original Design and Ultimate Destiny of the World Wide Web by Its Inventor*" (Harper, San Francisco, 1999) by Tim Berners-Lee, with Mark Fischetti.

<sup>11</sup> Such as found on [www.KarTOO.com](http://www.KarTOO.com) and some commercial offerings.

<sup>12</sup> Columbia University's Newsblaster (<http://newsblaster.cs.columbia.edu/>) provides a good research prototype demonstration of NLP summarization. Language Computer Corporation (<http://www.languagecomputer.com/>) offers commercially NLP based search solution technology as plug-in component capability.

crawling the web) may eventually find it, perhaps to pass it on to someone, who finds it of use.

Semantic Web efforts are largely based on development and employment of ontological engineering technologies that are on the verge of seeing the light of day in mid-2005. However, underlying ontological semantic meaning of contexts – at a deeper level of meaning – is the state of mind and intent of the communicator. In a theater, we can get a good laugh as an actor portrays someone, who misunderstands a situation or a message, and then begins chasing the misperception. On the other hand, attempts at misplaced humor, such as at the airport have led to unfortunate results for those attempting to be funny.

The two examples just cited highlight the adage that “context is everything.” Comedy may be expected in a theater play. On the other hand, the 'blind-justice' response in light of the 9/11 events and resultant seriousness of checking through airport security could even signify the loss in confiscation of a keepsake of great personal sentimental value. In a couple of cases familiar to the authors, a useful pocketknife and tool were confiscated due to the passenger’s careless oversight during hasty preparations for an urgent and important trip – undoubtedly a common occurrence. High sentimental value, personal importance, and intentions for use of objects are not easily detected nor verified at an airport gate. Similarly, by seeking to address this level of context and meaning for digital documents, HumanML complements other semantic based technologies by providing for inclusion of human related context in the form of standardized markup.

## What Areas of Government can Benefit?

There is a long-standing natural conflict between “*need to know*” vs. “*need to protect*” vs. “*need to share*” official government information. Even when resolved in favor of the latter, there are abundant examples of failure in making information and knowledge accessible to those who need it on a time critical basis. Witness government performance surrounding the infamous 9/11 event: had disconnects in timely sharing of information and analysis been properly addressed, it is realistically thinkable that the terrorist hijackers’ plot could at least partially have been pre-empted. Needless to say, open-standards are critical to interoperability across the many agencies and departments at all levels of government. In recognition of this fact, the Office of Management and Budget (OMB) established policies in 1998 for adopting “Voluntary Consensus Standards” as opposed to government-specific or vendor-proprietary standards<sup>13</sup>. The challenges of globalization and the War on Terrorism have only created more pressure and resultant

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<sup>13</sup> OMB Circular A-119, February 10, 1998

effort on finding solutions.<sup>14</sup> Once again, context is key and needs addressing in at least two areas cited here.

## The “Loose Lips Sink Ships” Factor

Unquestionably, information critical to national security needs to be protected. With threats to personal privacy such as rampant identity theft, who can question the need to protect personal information from public disclosure? And how can fair competition – the basis of our economy – be protected if official government information leaks bringing advantage to those who acquire it (cf: “insider trading”)? The other side of this coin, of course, is that a democratic “*government of the people, by the people and for the people*” is to serve only at the consent of the governed. The people who elect government officials pay not only their salaries but also pay for the means the government uses to gather, store, produce and use various categories of information and knowledge. Without public access to government processes and decisions for oversight, the people cannot elect and hold accountable officials who can govern well. The big question remains: how can the public readily access and use appropriate government derived information and knowledge bought so dearly with their tax dollars?

The historical solution has been to store hard copy documents in repositories with provision for access and protection by physical means. Document managers have used external markings in the form of labels, warnings, and stamps to control documents and equipment. In some cases, the use of internal notation in the form of warnings and textual markup down to section, page, or paragraph level helps to provide context. HumanML can provide a framework for standardizing and embedding such markup directly into digital documents at any level of granularity to facilitate automated handling and management processes to facilitate information protection and releasability.

## The “Ariadne's Thread” Factor<sup>15</sup>

Across all levels of government, a multitude of organizations – each with its own budget, acquisition, policies, and human resources – end up with vastly different infrastructure

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<sup>14</sup> See article "Military, industry and academia lay the groundwork for effective knowledge management tool designs" (<http://www.afcea.org/signal/articles/anmviewer.asp?a=906>) where issues long experienced in NATO and European Union arenas are coming to bring considerable pressure in today's high pressure world of small, agile, multinational, multicultural fighting forces and “a collaborative environment rife with language barriers, experiential differences and hidden agendas.”

<sup>15</sup> In one version of Greek mythology, Ariadne, the daughter of King Minos of Crete fell in love with Theseus and gave him a thread which he let unwind through the Labyrinth so that he was able to kill the Minotaur and find his way back out again. Georgetown University's Labyrinth project (<http://labyrinth.georgetown.edu/>) is set up to act as a version of Ariadne's thread to aid those pursuing medieval studies across the Internet's web.



and support environments. Over time, the same becomes true even within the same organization. Rapid technology change creates a churn of new system deployments and upgrades. In synergism with organizational restructuring and changes in mission emphasis, this yields a set of heterogeneous legacy systems along side new ones, all of which, as changes occur, must continually be re-organized and re-connected to function as a whole.

The results are usually an incompatible jumble of proprietary standards, data formats, and conceptual reference models. Two good examples are the integration of many separate entities into single new organizations in the form of the National Imagery and Mapping Agency (NIMA) – since evolved to National Geospatial-Intelligence Agency (NGA) – and the Department of Homeland Security (DHS). In each case, the consolidation of varied efforts brought on major effort and cost to reconcile how differences in processes, goals, and ways of thinking can come to be reflected and accommodated in integrated IT support systems.

As the aforementioned will attest, Knowledge asset managers are hard pressed to readily share their stored data, information, and explicit knowledge amongst themselves let alone deeply comprehend the knowledge assets, for which they are responsible. The same can be said for legacy and archival material held in the public trust. Newly acquired staff is challenged with steep learning curves to become familiar in order to maintain all organizational functions. As “old hands” retire, walking out the door is much tacit knowledge, understanding, and wisdom of experience that has not successfully been made explicit or otherwise transferred to newer staff. Complicating the situation is the need to provide public access to appropriate information and services to those, who come to search through the government labyrinth using their own, privately acquired commercial and open source technology to meet their own information and knowledge needs.

## **How Non-government Sector can Benefit**

### **“Who is that masked man?”<sup>16</sup> – The Source Factor**

“Who I Am” and “Why I am Here” are the first two stories communicators must tell before their message may readily be accepted. Recipients, before they take heed of the message, must answer in their own minds those questions demanded of the communicator.<sup>17</sup> Experienced knowledge workers already understand that considerable effort can be expended in validating information and knowledge, a fair amount of which

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<sup>16</sup> Context (for those unfamiliar with the phrase): at the end of each cowboy movie in the “Lone Ranger” series, someone asks this question about the departing masked stranger who came into town to help thwart the villain. Throughout this article are sprinkled various metaphors and allusions, for some of which further elaboration is intentionally left moot. Hopefully, the variety is broad enough to leave most readers with a better appreciation for context of understanding that HumanML might help provide.

time is spent vetting the sources to establish trust in them and how to understand properly what they have to communicate. This is even more important in the public sector, since the government context is missing. In the government sector, there is some expectation of public trust in the authority and certain points of view that stand behind what is published. But in the “Wild West” of the global Internet all bets are off. Hence the burden of validation becomes even heavier. By providing a standardized means to convey and establish contextual meaning, the use of HumanML would provide authors a chance to rise above the noise floor in the chaos of the Internet. At the same time, such use would offer researchers richer means to separate the wheat from the chaff to find the valuable nuggets of information and knowledge they need.

## **Transcending communication barriers – The Culture Factor**

The “masked man” allusion above highlights how use of HumanML might help ease cross-cultural communication as a means to clarify cultural and social communication differences in meaning. Cross-cultural issues obviously reach far beyond international government-level interaction cited elsewhere in this article.

Due to differences in language and logic constructs for understanding the world, human kind since the Tower of Babel has had some difficulty in communicating very well to common purpose. Yet, humans as social beings possess a basic set of concepts they understand at an instinctual, subconscious level. Perhaps due to this commonality in understanding, communicating these concepts tends to become highly contextual in that it can occur via subtle, non-verbal means. In fact, researchers indicate that, in human interaction, non-verbal components can often convey between 65 - 90 percent of true meaning. Since understanding becomes common between members within a particular cultural context, explicit means of expression becomes redundant and not generally necessary. But, in isolation from other cultures, each culture develops its own specialized terminology, nuances of meaning, and non-verbal means to express meaning grown and contained within the culture’s own information silo.

When verbal communication migrates to text-based documents, even richer vocabulary and more careful crafting of how ideas are expressed can hardly compensate for the loss of meaning defined by cultural and non-verbal context. Great writers and poets over the millennia spent their lives trying to use words to express the human condition in textual form. The richness of language traditions is the result with many fine nuances of understanding peculiar to each and is only learned largely at the intuitive level through experience over long periods of exposure and use. In a cross-cultural context, misunderstanding can occur due to the message receiver lacking this native level of tacit knowledge.

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<sup>17</sup> See *The Story Factor: Inspiration, Influence, and Persuasion Through the Art of Storytelling* (2002) by Annette Simmons, who posted on her website a copy of chapter one, in which she highlights “*The Six Stories You Need to Know How to Tell*” (<http://www.groupprocessconsulting.com/Chapter%201.pdf>).

## Transcending communication barriers – the Human Factor

But beyond cultural barriers to understanding are physiological and psychological factors that affect all human interaction. Not all are gifted in the same ways. The value in diversity is that each person in a community brings a unique set of skills, knowledge, understanding, and wisdom of experience; however, along with that value comes their own peculiar means and propensities for thinking, communicating, and contributing.<sup>18</sup> This holds true for any private or other kind of collaborative activity to include enterprise undertaken as commercial business venture, academic institution, or Non-Government Organization (NGO).

Open standards such as HumanML provided XML that can be associated with digital objects (documents) would permit automated adjustment of Human-Computer Interfaces to meet special psychological or cognitive needs (e.g. a user's special abilities, propensities, and preferences can be explicitly recognized as such, and the HCI can adjust with these factors in mind). While specialized HCI development has made some good advances, the HumanML aim is to provide a means to include human factor sensitive metadata with digital objects themselves that advanced design HCI across heterogeneous systems can use to perform their functions more effectively.

### Bottom Line – Future Potential

In a multi-media world of audio, graphics, and video, more non-verbal information is available to those willing to spend the time to go through the material; however, indexing, searching, and mining hours and days of it to interpret non-verbal and cultural clues is quite another thing.

Research in the area of **semiotics**<sup>19</sup> is endeavoring to identify and understand culturally specific signs that communicate meaning in non-verbal contexts. Researchers have identified large sets of signs that could be encoded and communicated via standard means. Applying the HumanML framework could provide for making that subtle context of human cognition more explicit, communicable, and amenable to digital processing. By enriching communication, employment of HumanML would aid understanding even across intra-cultural lingo and multi-media context barriers while, at the same time, permitting deep interoperable access to the material for knowledge mining and other forms of automated services.

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<sup>18</sup> “The potential intelligence of any human organization is widely distributed because the brains are widely distributed – one per person.” Warren Bennis in his forward to the book “*The End of Bureaucracy and the Rise of the Intelligent Organization*” by Gifford & Elizabeth Pinchot (1994).

<sup>19</sup> A short definition for Semiotics can be found in the Wikipedia entry for it at URL: <http://en.wikipedia.org/wiki/Semiotics>, which also includes a good overview of the subject. For more in-depth understanding, see “*Semiotics for Beginners*” by Daniel Chandler at URL: <http://www.aber.ac.uk/media/Documents/S4B/semiotic.html>.

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