



Overview of Epiture®

Knowledge Networks that Adapt™

Executive Summary

Epiture® is a technology developed by ManyWorlds based on our research and inventions related to systems that adapt (i.e., learn) to become increasingly useful over time. ManyWorlds' research in this area has included deep dialogs with leading businesses and institutions on their unfulfilled information management needs.

What we learned from these conversations was that even with the many advances in IT over the past decade, businesses and institutions were still severely limited in effectively managing information and knowledge within their organizations, as well as collaboratively managing knowledge with other third party organizations. And with each new software package they installed, they had increased the complexity of accessing and managing information, rather than moving toward a solution.

Our research indicated that the unfulfilled needs could be best addressed by a system model we call "adaptive knowledge network management." ManyWorlds' Epiture technology is a commercial technology available right now and applied by leading organizations that represents the world's only systems platform based on the adaptive knowledge network model.

What is Epiture? Fundamentally, Epiture is a computer application that builds *learning* into any information management environment. Epiture provides the ability to easily network together a collection of information "objects," where the objects may take any digital form, such as Web pages, documents, and even interactive applications. Since objects can represent people, Epiture can uniquely enable integrated knowledge and social networking.

Importantly, the relationships between Epiture-based objects may be by degree. The flexibility of this type of relationship structure is one of the key architectural aspects that enable Epiture to learn. The other aspect that enables system learning is that Epiture has a built-in *adaptive intelligence* capability that automatically infers user preferences and interests from usage behaviors – the behaviors of the particular user herself and/or the behaviors of users who have inferred similarities to the user. Epiture's ability to understand preferences and interests gets better and better over time – in other words, Epiture actually learns!

Epiture delivers this learning back to the user in the form of *adaptive recommendations*. This is like having a personal assistant helping the user to navigate through the vast and complex collection of information available. Epiture learns to understand *personal* preferences better and better over time, but it also leverages the wisdom of the *community*, and effortlessly transfers relevant learning from

the community to the individual. Epiture can also apply its learning to automatically modify the structure of the knowledge network – adapting the actual relationships among information objects in accordance with personal and community preferences. In addition to the learning advantages, this *self-monitoring and self-maintaining* capability also dramatically reduces the manual support requirements that traditional systems require.

Best of all, Epiture makes it easy to manage both personal and shared adaptive knowledge networks, as well as enterprise scale adaptive knowledge networks. No programming whatsoever is required to manage all aspects of Epiture-based adaptive knowledge networks, and Epiture automatically does all the heavy lifting of optimizing itself on a continuous basis.

Epiture can manage existing information stored in any format, application, and physical location. An Epiture adaptive knowledge network complements all existing applications, such as Microsoft applications and files, Web pages, content management systems, search engines, ERP’s, etc. It provides virtual, persistent, and adaptive integration across all of these applications, and can automatically generate customized Internet, Intranet and Extranet sites and applications from the knowledge network.

Epiture not only makes knowledge workers significantly more productive, but it amplifies the value of IT systems already installed, while serving to reduce the costs of future IT!



The Business Case

Knowledge worker productivity is the perhaps the most important driver of today's economy. And knowledge worker productivity is a function of the ability to find, integrate, and contribute information flexibly and quickly. A wide variety of applications are available to address this issue – yet, each addresses only a part of the problem, and in so doing creates additional problems.

Recently enterprises have begun to turn to search applications (Google, Autonomy, etc.) as a solution. In essence, search is naturally turned to when information structure fails. However, although search can be helpful, invariably there is disappointment. The main reason for the disappointment is that the most effective search technologies used on the Internet (e.g., Google) rely on some level of social information, and not just pattern matching of text within documents. Using social information (such as linking patterns among Web pages) can significantly increase the relevancy of the search answer set.

However, in the enterprise environment, very little social information has typically been explicitly captured, and search therefore must rely almost solely on pattern matching of document contents. Hence the value of search is often limited.

Epiture provides a structure that reduces the need to just fall back on search to try to “integrate” information on a one-off basis. By supporting an unlimited set of virtual and persistent knowledge network structures, Epiture makes it much easier for knowledge workers to find what they need, and to contribute new information that can be “consumed” by any or all of an unlimited number of other customized knowledge networks.

The economic leverage from improved knowledge worker productivity can be surprisingly large. A theoretical case in the Appendix of this paper illustrates a quantification of this leverage.

And in addition to knowledge worker productivity, Epiture implementations that are customer-facing can also directly contribute to increased revenues and margins by enabling adaptive commerce, in both B2B and B2C environments. The leverage from these types of applications can be even greater than the already significant rewards from internal enterprise implementations.

Cases and Applications

Epiture can be used as an internal learning and knowledge management application, and/or can be used as an adaptive environment to extend to customers, consumers, suppliers, or other business partners. Any organization whose products, processes or assets have a significant knowledge-based component is a candidate for Epiture applications.

A few examples:

- Global 100 companies have applied Epiture to enhance knowledge worker productivity in organizations such as Finance and R&D.
- One of the world's largest Internet development companies has used Epiture to power much of their own public Internet site.
- Large IT/Consulting organizations have applied Epiture technology to create customized environments for their clients – enabling the acquisition of large-scale accounts with potential of up to \$200mm/year.
- Boutique consulting businesses have applied customized Epiture to out-compete much larger firms by demonstrating leadership in cutting-edge Web environments.

Epiture: The Next Generation System Architecture

Epiture is an entirely new way to manage and access knowledge and content (where content can mean anything from text to multimedia to interactive applications). Although Internet-based, instead of the web page, the fundamental operating units in Epiture are topics and content objects. Each Epiture knowledge network can have many different types of content objects (e.g., an article object, a people object, an applet object, etc.), with corresponding definable meta-information, and these objects can be created and implemented with no programming of any kind.

Individual objects can be related to one another as desired, and by degree. The result is a rich network of content. In fact, it is a "fuzzy" network -- that is, topics and content can be partially related to one another. This is the fuzzy set paradigm, as opposed to the hierarchical paradigm, on which today's Web and nearly all other traditional applications implicitly rest.

The fuzzy content network paradigm provides some big advantages. First and foremost, it reflects the way the human mind actually categorizes and processes information, and therefore is more intuitive to use. It also allows for much more graceful scaling than do classic hierarchies – increasingly large knowledge bases can be flexibly managed and navigated using Epiture, without the brittleness inherent to less flexible structures. And third, it is the only type of information structure that is truly able to adapt – a point which will be covered in more detail below.

Epiture enables content experts and ordinary knowledge workers, without any IT expertise whatsoever, to assemble an integrated network of topics and associated content. The network, including the relationships among topics and content, and meta-information about the content items, essentially constitutes a semantic network with regard to the particular topical domain. This content network can then be applied to dynamically and automatically generate an Internet or Intranet site or portal. In fact, the network can dynamically create an unlimited number of customized interfaces or portals.

Epiture was architected from the beginning to be automatically adaptive. Without any additional effort on the part of users, Epiture learns to understand the preferences and interests of users. The learning is based a wide variety of usage behaviors, including navigation paths, information that is stored or tagged by the user, and direct user profiling and feedback. Epiture makes inferences on the preferences and interests of an individual user based on the individual's usage patterns, and also basis inferences derived from the usage patterns of other users.

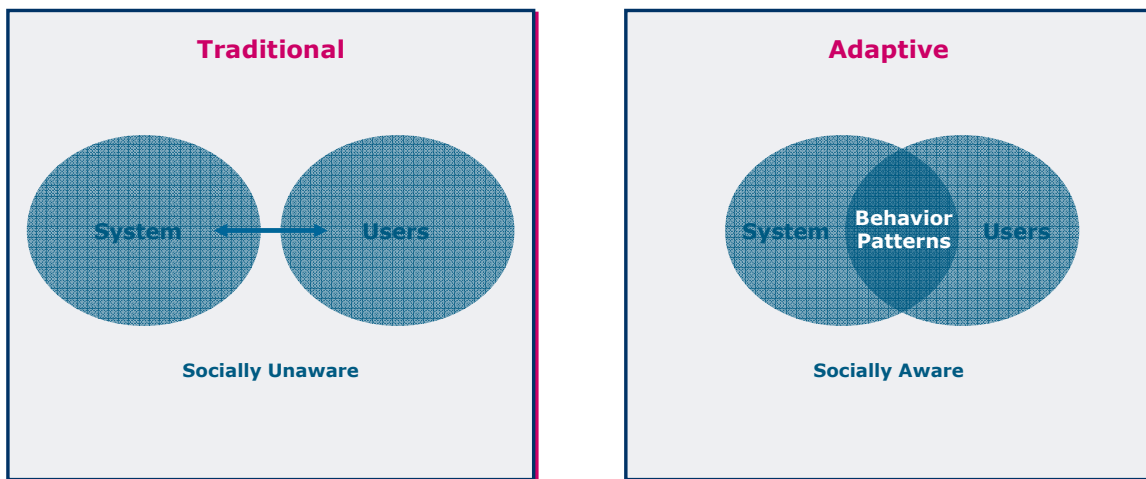
The learning Epiture derives from individual and community usage patterns is applied in several different ways. First, Epiture delivers adaptive recommendations to users as they navigate through the knowledge network. The recommendations highlight items of content which, given the current object being accessed by the user and given the user's preferences and interests, are likely to be highly relevant to the user. Second, Epiture also delivers adaptive recommendations outside of the

navigational context – say, via e-mail. These recommendations are based on user preferences and interests and may be cued by specific triggers such as new content being available in the knowledge network that Epture infers will be particularly relevant to the user. Whether delivered to a user within or outside a navigational context, Epture recommendations may include topics, content, or people, as well as providing the recommendation recipient an explanation of why the recommendation was made.

Third, Epture can apply the inferences on individual and community preferences and interests to modify the knowledge network itself. For example, relationships between objects may be strengthened or weakened depending on the preference inferences. In this way, persistent community learning effects are embedded directly in the knowledge network itself, and the system is literally self-maintaining and self-optimizing.

Epture’s architecture uniquely enables an integration of social networks and content management. Epture represents communities, and individuals within a community, as explicit knowledge objects. But unlike existing social networks, Epture integrates the network of knowledge generated by the individuals within the community (also represented as knowledge objects) with the people. And finally, Epture keeps track of the interactions between people, and, derivatively with people’s owned or authored content, to enable an adaptive and integrated social and knowledge networking system. In this regard, Epture is the first and only embodiment of an emerging application paradigm that the Gartner Group calls “Networked Collective Intelligence.”¹

In summary, Epture can be thought of as a new level of IT abstraction that integrates the application, content, and social networks below it. And in addition to providing integration, this new level of abstraction also enables automatic adaptation to use and changing circumstances.



¹ Garner Group Research Report ID G00127668, 2005, “Hype Cycle for the High Performance Workplace, 2005”

How Epiture is Unique

There is no directly competitive product or service to Epiture, as it fundamentally defines a new technology space. As mentioned above, Epiture embodies an emerging application area that Gartner Group calls “networked collective intelligence.” In other words, Epiture leverages the “wisdom of the crowd”² to enhance personal and organization learning. Epiture integrates major elements of the traditional categories of web development and management, portals, and content and knowledge management, in addition to more recent applications such as wikis and blogs. Epiture complements installed packages of both the traditional and more recent software categories. For example, Epiture can enhance Enterprise Information Portals (EIP), and integrate with traditional document management systems.

The following chart highlights the key distinguishing features of Epiture with enterprise Web and content management software applications and “Web 2.0” community-based applications.

	Pre-Social Computing: Robust but Limited/Inflexible		Early Social Computing: Quick & Dirty/Throw Away		Enterprise- Social Computing	
	Web 0.0	Web 1.0	Web 2.0		Web 3.0	
	Document Management <i>Documentum, Livelink, FileNet, etc.</i>	Web Site Management & Portals <i>Vignette, Interwoven, Plumtree, etc.</i>	Social Networking <i>LinkedIn, OpenBC, Facebook, etc.</i>	Tagging/ Distributed Content <i>Digg, eSnips, JetEye, Flickr, YouTube, etc.</i>	Collaborative Content <i>Wikis, Blogs, etc.</i>	Adaptive Knowledge Network <i>Epiture</i>
Web Site Management						
Automatic generation of web sites from content	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Automatic generation of multiple web sites from content	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Easy for anyone to contribute content	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Easy to create/manage automatically generated site(s)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Built-in adaptive recommendations of content	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Document/Digital Asset Management						
Management of all types of documents/multi-media/apps	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Easily manage knowledge across business networks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Adaptive management of all types of documents/multi-media	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Enable generation of personal taxonomies that can be shared	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Social Networking						
Basic social network functions	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Fully integrated social network and content network functions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Adaptive recommendations of people as well as content	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Social Tagging and Taxonomies						
Standard tagging functions	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Advanced fuzzy tagging functions (tags by degree)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Collaborative taxonomies	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Enterprise Fit and Sustainability						
Enterprise compliant technologies	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Key features covered by global patents/patents pending	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

² Surowiecki, 2004, “The Wisdom of Crowds,” Doubleday

Epture also complements advanced search engines. For example, Autonomy is a leading enterprise search engine that incorporates an advanced statistical pattern matching capability that allows first-cut categorization of large amounts of content. Epture provides a structure that can intelligently store the results of Autonomy-type categorization, and then allow clients to apply all of the features of Epture to this content. In other words, Epture plus a package such as Autonomy provides a nearly end-to-end content management solution for large businesses and content management companies.

Furthermore, Epture complements efforts to leverage XML-based standards to create industry or domain-specific semantics. These are what we call "bottom up" efforts, while Epture comes at the problem top down. As these XML-based efforts materialize into tangible results, they can be effectively integrated into Epture-based applications. Epture can also be used to support ISO standards related to knowledge management, including Topic Maps.

In summary, Epture is differentiated from all other current applications in that it flexibly addresses opportunities for improvements that span the areas of organizational learning, general knowledge and content management, as well as enhanced relationships with customers and other business partners.

Epture is also different because it is designed as an open and generalized fuzzy content network, with powerful and flexible capabilities for content network syndication and cascading, and with the ability to dynamically adapt to community and individual usage patterns. It has been specifically designed to be open and leverage standard, established commercial software packages. For example, alternative search engines can be incorporated, Epture can conform to the look and feel of any particular EIP or HTML-based interface, and commercial relational DBMS's are fully leveraged. The design goal from the beginning has been to maximize complementarity and value to clients, and not unnecessarily overlap with other effective IT packages.

Key Features

The following are just some of the key features that put Epiture in a class by itself:

- ✓ The ability to **create a rich network** of content, knowledge, and people based on the fuzzy set paradigm, which enables a richer navigational experience for users and makes feasible the effective management of both very large knowledge bases, and personal knowledge bases.
- ✓ **Easy-to-use publishing and content architecture** tools that can be learned within a few minutes. This key ease-of-use feature dramatically reduces the cycle time of publishing content, and thereby maximizes community-based content contributions and rich content integration. The result is an increased level of overall quality and freshness of the content base versus other approaches.
- ✓ The ability to **integrate any type of content** into the adaptive knowledge network, including text, presentations, multi-media and applications. Eliminates the old paradigm of separate "content" and application-based systems -- Epiture treats applications as just a more interactive form of content. Complements and amplifies the value of existing IT infrastructure and applications.
- ✓ A complete set of tools for **navigating the adaptive knowledge network**, including search functions, topic-based views, content-based views, and a unique relevancy function that dynamically displays related topics and content based on the degree of relatedness.
- ✓ Ubiquitous user access to **adaptive recommendations** that are automatically generated based on inferences of user preferences and interests derived from personal and community usage patterns. This feature provides automatic organizational learning, with novices receiving different recommendations than experts, for example. Unlike any other system, the recommendations include an in-depth set of explanatory information.
- ✓ A truly **integrated knowledge network and social networking** capability, enabling rich descriptions of people that can be shared as desired in an identical manner as content, and enabling intelligent and automatic recommendations of people in addition to content.
- ✓ Advanced **people connection capabilities** that automatically infers the degree of similarity of areas of focus among users, and facilitates connecting knowledge workers with the appropriate expertise they require.
- ✓ Support for **adaptive business processes** through adaptive workflow elements integrated within adaptive knowledge network structures and the ability to deliver just the right information at the right time as business process activities are being conducted.

- ✓ The ability for users to **subscribe to e-mail or RSS-based feeds** containing adaptive recommendations based on their personal preferences and interests, and the automatic management of the associated distribution lists and related user profiles.
- ✓ The ability to create and maintain **personal knowledge networks** and to manage, through powerful but easy-to-user security functions, the sharing of the knowledge networks with any or all other users at any time.
- ✓ Comprehensive real-time **behavioral-based statistics and metrics** associated with content and people, including the overall influence of the content or person within the knowledge network -- -- capabilities that go far beyond current web page-based tracking systems. Facilitates organizational learning by highlighting the value of content assets and the contributors of content and thereby encouraging and rewarding effective knowledge sharing.
- ✓ Complete facilities for the **dynamic generation of an unlimited number of customized adaptive knowledge networks** and associated portals from the common content network, including dynamic topic network selection and distribution, security settings, etc. Hundreds of individual adaptive knowledge networks, spanning hundreds of topics and thousands of individual content items can be easily and effectively managed in a way that is available in no other technology. This capability provides support for the ultimate level of customization and personalization, whether for groups internal to a business, or external (customers, suppliers, partners, etc.), and all for a negligible incremental cost.
- ✓ **Automatic system self-maintenance** powered by the adaptive intelligence function, and based on sophisticated inferences of collective usage patterns. Builds persistent learning within the network of knowledge, and dramatically reduces manual maintenance costs.
- ✓ **Automatic peer review** function that supports maintenance of the highest possible quality of content.
- ✓ Flexibly support the **look and feel** of any Internet or Intranet site, whether based on HTML, or generated by other commercial packages such as EIP's.
- ✓ Flexible integration of auxiliary content and capabilities such as **news feeds, chat facilities, shopping carts**, etc.
- ✓ The ability to automatically generate and maintain web sites with the **absolute highest standards of aesthetics**. A 100% Epiture-driven web site has recently won the Webby Award, for example, an award that has previously been awarded to only highly manual-intensive and

very costly web sites. Now any web site powered by Epture can automatically be an award winning site.

- ✓ And many more break-through functions are coming that will continue to make Epture the world's most advanced adaptive knowledge management platform . . .



Implementation

Eiture is typically delivered as a Web Service application. In a Web Service implementation, ManyWorlds manages the Eiture application on its commercial infrastructure. This infrastructure is provided by one of the world's largest commercial hosting providers, and provides full security and recovery processes. All sensitive information can be kept within the client's fire wall – Eiture easily manages the knowledge network across infrastructures with full security assurance. Web Service implementations enable ManyWorlds to establish a full client knowledge network within days!

A client can also run the Eiture application and associated knowledge bases within their firewall on their own infrastructure, if preferred.

Eiture technology is based on Microsoft .Net architecture and commercial relational database management systems, ensuring maximum scalability, and compatibility with any corporate information technology environment.

Appendix: Knowledge Worker Value Leverage

How much is the type of flexible knowledge integration and access that Epiture uniquely enables worth? Well, it obviously depends on the specific organization and application, but we can assess the theoretical value by applying a modern network value model³. This model suggests that the value of a knowledge network is proportional to $N \ln(N)$, where N is the number of nodes in the network. So let’s look at an example (the details behind these calculations are available from ManyWorlds). Suppose we have a hypothetical organization with the following characteristics:

Current Knowledge Assets and Growth	
Number of Knowledge Workers	500
Current Number of Items of Content Contributed/Yr.	50
Number of Years of Cumulative Content	10
Knowledge Base Topology	
Number of Sub-Organizations	4
Number of Independent Knowledge Bases per Sub-Organization	4

Assuming that the 250,000 knowledge assets are equally distributed among the 16 knowledge bases that have little current integration, we can calculate that an integrated knowledge network would be expected to be up to 30% more valuable than the current state. This is significant! To put that into real financial terms, as a baseline, it would be reasonable to expect each knowledge worker to generate at least \$100,000/year of net value, or \$50 million for the whole organization. That means an Epiture implementation would be expected to increase value by up to \$15 million/year.

But that is actually an underestimate because Epiture would also enable more units of knowledge to be contributed by each knowledge worker each year. If we assume each knowledge worker could contribute 50% more content per year, then in five years the model suggests that the organization could be expected to generate up to 50% more value per year with an Epiture implementation versus the status quo. That’s potentially \$25 million per year! The leverage of knowledge worker productivity is truly immense and actually *attainable* through Epiture-based knowledge networks.

Of course the example above focused on knowledge worker productivity. Epiture implementations that are customer-facing can also directly contribute to increased revenues and margins by enabling adaptive commerce, in both B2B and B2C environments. The leverage from these types of applications can be even greater than the already significant rewards from internal implementations.

³Odlyzko & Tilly, 2005, “A Refutation of Metcalfe’s Law and a Better Estimate for the Value of Networks and Network Interconnections”



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