# Reshaping the Enterprise with Web 2.0 Capabilities: Challenges with Main-Stream Adoption across the Department of Defense

Dr. R. Cherinka, Dr. R. Miller, J. Prezzama and C. Smith

*The MITRE Corporation*
*4830 W. Kennedy Blvd., Tampa, FL 33609*
*Phone: 813-287-9457, Fax: 813-287-9540*
rdc@mitre.org, drbob@mitre.org, prezzama@mitre.org, chadsm@mitre.org

## ABSTRACT

*In this volatile and uncertain environment, today's large enterprises are facing many challenges being agile and responsive providing the best service to support the mission. A number of trends influencing IT enablement, governance, management and workforce transformation are driving factors to large enterprises seeking new methods for information sharing, collaboration, transparency and on-demand capability. Enterprise 2.0 methodologies & technologies hold significant promise for Department of Defense (DoD) and other Federal organizations, but numerous challenges must be identified and overcome to achieve this anticipated success. In this paper, we discuss our efforts to help our DoD sponsors to understand and address many of the challenges associated with wide-spread adoption of Enterprise 2.0 technologies across the DoD enterprise. In particular, we describe our experience in implementing an Enterprise 2.0 interactive portal and tools set, "CIOweb", that is being developed by the Chief Information Officer (CIO) to shape and manage the information enterprise, provide a strategic business planning process, develop a Web 2.0 technical forecast and roadmap, influence long term objectives of the CIO and establish a governance structure to manage this environment. We highlight some of the capabilities provided, techniques used, challenges faced, lessons learned and how this approach impacted the user.*

**Keywords**: Agile Engineering, IT Governance, Information Management, Enterprise 2.0, Web 2.0, Wiki

## 1. INTRODUCTION

In previous papers, we introduced a methodology where MITRE is helping a United States Department of Defense (DoD) organization to effectively harness Enterprise 2.0 technologies across the organization as part of the Chief Information Officer's (CIO) Information Technology (IT) governance process [2, 3, 4].

In this paper, we discuss our efforts to help our sponsoring Government CIO successfully define the vision, strategy and resources to build the future IT enterprise. We highlight our experience in implementing an Enterprise 2.0 interactive portal and tools set, CIOweb. This capability is being developed by the CIO to shape and manage the information enterprise, provide a strategic business planning process that supports governance and visualization, develop a Web 2.0 technical forecast and roadmap, influence long term objectives of the CIO and establish a governance structure to manage this environment.

Based on this work, we believe Enterprise 2.0 methodologies & technologies hold significant promise for Department of Defense (DoD) and other Federal organizations. However, we found that numerous challenges must be identified and overcome to achieve this anticipated success.

For the CIO in a web 2.0 enterprise, there are several key challenges worth exploring further [1]. These include:

- Adopting Social Networking: It's not a technology problem…it's a culture change.
- Leveraging information: Access to knowledge experts and effective encouragement of information sharing across the enterprise.
- Driving business growth and ROI: Tehcnological innovation to improve productivity, yet reduce costs
- Leveraging virtualization and mobility: On-demand services either in house or out sourced through the "cloud".
- Protecting Corporate Intelligence: New forms of cyber attack, both on existing and emerging applications, tools, and infrastructure.

## 2. TRENDS INFLUENCING THE DOD

Enterprise 2.0 is driving demand and innovation in the enterprise. James Staten (Forrester) has noted that "…you

can't manage IT the same way you've always managed it and empower new flexibility. [7]"

We see the following trends influencing large DoD enterprises:

**Policy and governance:** IT management is shifting from providing and controlling assets to defining policies to support business processes. This allows stakeholders to exercise control over IT requirements and provides more alignment to stakeholders needs.

- There is more focus on enabling the consumer. Expectations around usability are increasing.
- End-users are getting involved in technology selection; it's not just the IT department's decision anymore [5].

**Transformation:** New technologies and viewpoints (e.g., Generation-Y) transforming the workplace:

- Traditional means of communication are being replaced by newer tools that focus on increased collaboration.
- Younger, digital natives demand desolving corporate barriers and increased pace of change.
- Experienced workforce often resistant to new processes and tool adoption.

**Social Networking**: New collaboration tools and on-line communities that operate both inside and outside the Enterprise [9]:

- Tools available in the commercial space being adopted inside the enterprise.
- Increased collaboration and openness putting proprietary business information in generally accessible locations such as the searchable web.

**Mobility:** Wireless connectivity is changing how people work:

- Proliferation of mobile devices and internet access points.
- Digital nomads create new work patterns.
- Data in motion increases risk to the enterprise.
- Virtualization to manage on-demand services.

The major gains of tomorrow are much more likely to be found in [8]:

- Spanning and interconnecting processes across internal and external organizational boundaries.
- Focusing on the people in a process and enabling them to make better decisions rather than automating them out of the process.
- Enabling the business to change things quickly, inexpensively and with minimal IT involvement.

## 3. WHAT IS ENTERPRISE 2.0?

We view Enterprise 2.0 as the adoption of web 2.0 technologies within the enterprise. These include the use of lightweight client/server communication tools such as web logs (blogs), wikis, on-line communities, and profiles of expert practitioners. These tools enable user controlled content and communications. A typical toolset consists of:

- Blogs - easy content publishing, one to many
- Wiki's - interactive, iterative, group publishing and information sharing
- On-line communities - discussions, many-to-many and integrated with email
- Mash-ups – Composable, on-demand, web capabilities and information sources
- Micro-Blogging, Chat, voting and other social tools - Social collaboration
- Portable applications and "cloud" data storage.
- Knowledge experts – searchable catalogs of gray beards for expert advice

Enterprise 2.0 capabilities provide increased value and return on investment (ROI) through employee collaboration, increased efficiency, connection to all members of an organization, and democratized information.

## 4. ENTERPRISE 2.0 CHALLENGES

Enterprise 2.0 represents the technologies and business practices that will liberate the traditional workforce from the constraints of legacy communication and productivity tools. It provides managers and their staff with access to the right information at the right time through a web of inter-connected applications, services and devices. Enterprise 2.0 makes accessible the collective intelligence of many; translating to a huge competitive advantage in the form of increased innovation, productivity and agility [6].

Our research continues to show how Enterprise 2.0 can provide new and better ways to manage information and provide capabilities in response to quickly changing needs to affect the DoD enterprise. However, adoption of this technology presents many challenges.

### *Appropriate use of existing/emerging tools*

In a diverse environment with many alternative tools to choose from, it can be difficult for the community to adopt proper usage of the various tools for the correct actions. Deriving values from these tools can be difficult. Many capabilities have observable overlaps and address similar problem spaces, placing community members in a

position to decide which tool to use. This can create issues as the user community fragments with some groups using one suite of tools in contrast to another group, or different groups may adopt similar technology suites while employing them in substantially different ways. In addition, interoperability issues as well as confusion over how best to operate are typical by-products.

We've observed that everyone seems to have a different opinion about proper use of tools as well as what constitutes their misuse. Etiquette issues arise similar to those that occurred in the email days of email adoption.

### Organizational transformation

The next generation of users (digital natives) is currently growing up in an Enterprise2.0/Web 2.0 environment. They are inherently accustomed to Wikis, Blogs, Mashups and the like. As we have seen with e-mail and other common applications, these technologies will be perceived as an invaluable asset in our staff's multimedia toolbox of tomorrow; they will expect our DoD enterprise architectures to inherently have these capabilities. However, the majority of current staff is either unfamiliar with or slow in adopting new social business environments as well as new networking techniques and tools.

Complacency can also be an issue in this matter as newer, better-suited technologies are ignored or sporadically leveraged as members instead rely on well known, long-standing capabilities (e.g. use of email for urgent matters versus chat or other presence-based, on-demand collaboration alternatives).

Adoption and proper use of Enterprise 2.0 tools must be encouraged. Their use must be directed and embedded into organizational processes in order for them to succeed. Otherwise these new means of the collaboration mechanisms and the ROI benefits they supply will not materialize.

### Organizational governance

Enterprise 2.0 implementation requires a strategy to make policy decisions and establish appropriate governance procedures. Once agreement is reached, the governance structure must dictate a true process for implementation. Users must be encouraged to accept and apply these new procedures. Techniques to determine the level of acceptance as well as articulation of benefits have yet to be determined and will be addressed in future work.

Governance processes are often overweight, take too long to develop and suffer from slow implementation. This further increases resistance by staff to learn how to use the new tools or update their business procedures. New approaches to governance policies and management oversight procedures and tools need development and articulation. These new procedures should address also validation and accreditation of the toolset. Further they need to be cycled in continuously, similar to the rapid and agile development techniques employed in software engineering.

Emerging collaboration techniques and tools often present significant risks. There is the potential to publish and/or access information outside of official channels without following organizational policy. Not only can this present security challenges and incidents, but it can lead to embarrassing situations for the organization. For example someone can fire off a twitter tweet without considering the implications of the tweet being expoited due to its availability on the searchable web.

Popular and provenly useful capabilities are often mirrored within the community enclave as a way of providing similar capability while protecting community privacy, but such private offerings often run into adoption problems in comparison to their public counterparts. Similarly there is often the desire to use publically available capabilities within the private and protected enclave. While the internal service may be well engineered and meet or exceed the capabilities of the public service, community members often dislike maintaining separate identies with separate release requirements and having to update separate information spaces. When such conflict occurs, users will often adopt the least restrictive medium and/or the service with greater visibility when available, resulting in both lack of use on the internal service and potential release of inappropriate information on the public forum. Creation of simple but effective bridging and forwarding mechanisms between the two capabilities can help increase acceptance and utilization of the internal tool, but it does not solve the problem.

Similar to the way in which use of public collaboration service can result in the release of inappropriate information to the civilian space, widespread adoption of self-organization collaboration tools within an organization can result in the spread of information outside of standard (and, in some cases, required) operating procedures. Enabling ad-hoc creation of communities with minimal or no restrictions or processes for obtaining membership provides a powerful way for users to achieve valuable, sometimes necessary, information sharing in a timely fashion. However, an end result of this openness can be content visibility to members without regular access to the content, in some cases including members who should not have access.

### Knowledge Management

Every organization amasses a large body of corporate expertise over time. This knowledge base includes current and archived content, subject matter experts scattered throughout the organization, various knowledge sharing tools such as email lists and online repositories and knowledge workers whose responsibilities include searching out and cataloging knowhow. The challenge is enable members to seek out and employ this knowledge on behalf of the organization's goals and objectives – often much of this potential knowhow goes undiscovered and untapped.

Successful knowledge management requires that formal knowledge management processes be incorporated in to the organization's standard operational procedures and information sharing infrastructure. Knowledge sharing tools that enforce proper content restrictions should be made available to all. Subject matter experts should be identified and cataloged to support discovery and access. Content web sites should incorporate disparate data sources to aggregate useful information and enhance situational awareness.

### Innovation

Adoption of Enterprise 2.0 technologies both drives and at the same time requires innovation. Without reason to change, change may not occur. Many of today's mashups, while once innovative, are now just updated versions of the common approach of linking to Google maps. While such mashups are very useful, new forms of content aggragation to tie in other media and access various data formats are necessary to continue momentum towards the promise of collaborative environments and knowledge management.

Due to technical innovation as well as economic and environmental pressures, our workforce is becoming more mobile. Mobile workers, or digital Nomads, are the "new normal" and should be treated as the standard, not the exception. As C. Clark observes, cost controls, help desk support, security posture and so on are becoming more challenging. In addition, new use cases that fall outside existing policy and procedures continue to arise [11].

Digital Nomads require better tools. These "disadvantaged users" can suffer from asynchronous connectivity, limited bandwidth, limited storage, reduced processing and power constraints. New capabilities may go unused from lack of awareness. Better advertizing, discovery mechanisms, and tool ranking procedures are needed.

### Security

The rapidly evolving toolset to compromise or "hijack" social networking applications and web sites is a major challenge. These attacks are similar to those used against ordinary web sites and standard email discourse. These attacks are now common. Criminals are adapting tried and true approaches such as phishing, viruses, and malware infestation. Social networking is particularly vulnerable as they increase the availability of information needed to gain one's trust [10]. This is exacerbated by the increasing amount of public information available on social networking sites such as facebook and the use of chat services such as twitter. Social networking environments and associated tools and services must be treated with the same attention to security that is given to email security. Social networking tools must be upgraded to provide better defense against those that seek to exploit them for nefarious purposes.

## 5. DoD CASE STUDY IN HARNESSING ENTERPRISE 2.0

Our research in understanding the nuances of the Enterpirse 2.0 challenges discussed above as well as potential ways to address them is based on our experience over the past year helping several DoD customers to introduce and use Enterprise 2.0 capabilities within the DoD enterprise. In this section, we highlight a case study of two initiatives, CIOweb and Mikro for illustration [2].

Our customer, the CIO has established traditional policy and guidance in many areas of enterprise IT development and operation. However, this guidance is not part of a published and overarching strategic plan for the IT enterprise, nor does it assist with the adoption or implementation of Enterprise 2.0 technology. In an effort to help mitigate these shortfalls, MITRE is developing for the CIO, a *Strategic Enterprise Plan (SEP)* focused on business, management and technical strategies for guiding the IT enterprise in the following areas:

- Enterprise Planning
- Business Mission areas
- CONOPS development
- Enterprise Business Objectives
- Business Processes Management
- Portfolio and project management
- Policy and Governance
- Service Level Agreements & Metrics
- Enterprise Architectures

The SEP and its components are hosted on a wiki based environment called the *CIOweb*. Presenting the SEP in this Web 2.0 environment is intended to empower the

CIO with the benefits of "*social networking*" in the area of enterprise governance.

One method used to introduce and socialize Enterprise 2.0 capabilities that MITRE used, was the development and use of CIOWeb. The CIOweb provides the collaboration capability to support the *on-line community* of IT developers and consumers supported by the CIO. This community uses CIOweb as a knowledge base, information sharing site, and idea clearing house to evolve and manage the IT infrastructure. Figure 1 shows a screen shot from a portion of the CIOweb.
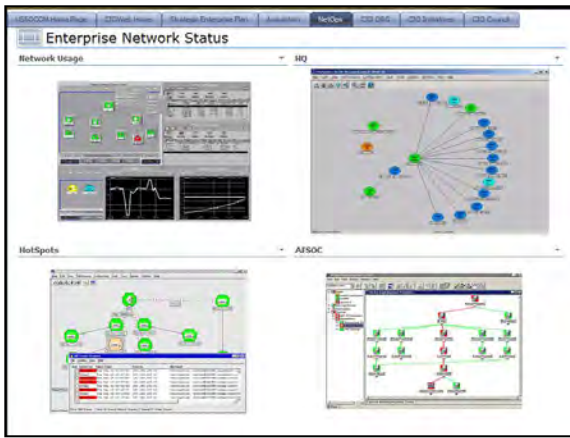


**Figure 2. Using Mash-Ups**



**Figure 1. CIO Web**

The CIOweb is being used to shape and manage the information enterprise by hosting technical forecasts and roadmaps, influencing long term objectives, establishing governance structures, and providing implementation and execution guidance through the SEP. The intent is that CIOweb will enable enterprise level management through an interactive Enterprise 2.0 environment with tools to support collaboration and the strategic planning processes that embrace governance and visualization techniques.

By harnessing the power of Enterprise 2.0 techniques to support Information Enterprise governance structures and visualizations, CIO Web will allow the creation of a more agile, responsive and cost-effective IT environment, embracing and empowering the user community as opposed to restricting it.
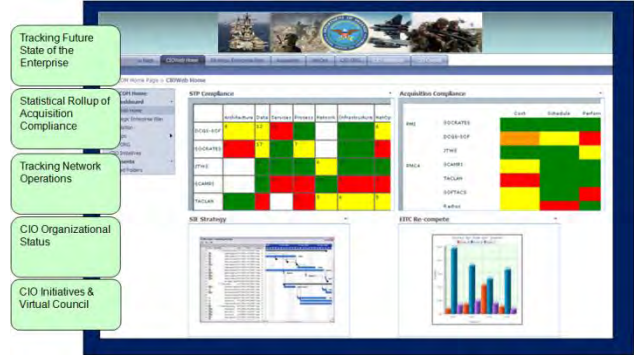
In an effort to overcome the challenges of organizational transformation and derived value, the use of mashups was introduced in CIOWeb (Figure 2). The mash-ups allow users to quickly integrate information necessary to enhance transparanecy and situational awareness for tracking the health and status of the IT enterprise, network operations, and other CIO initiatives. Visualizations will be empowered by user selectable dashboards. These dashboards will employ automated statistical roll-ups utilizing data through survey generation, analysis, and pre-existing database content. All aspects of the CIOweb environment can be visualized as web parts during the creation of personalized dashboards. This personalization capability becomes a key factor in assessing value and acceptance.



**Figure 3. Using Wiki's**

As shown in Figure 3, wiki's are being used to socialize key strategic documents across the enterprise, allowing for top-level CIO vision, guidance, governance and policy to be shared, while program managers and system engineers publish and share key products associated with managing the acquisition, operational and technical aspects of the enterprise. This approach encourages and empowers everyone in the organization to provide content and/or feedback on various topics. By using data

stewards for key topic areas, the content in the wiki's can be reviewed, monitored and controlled as appropriate.
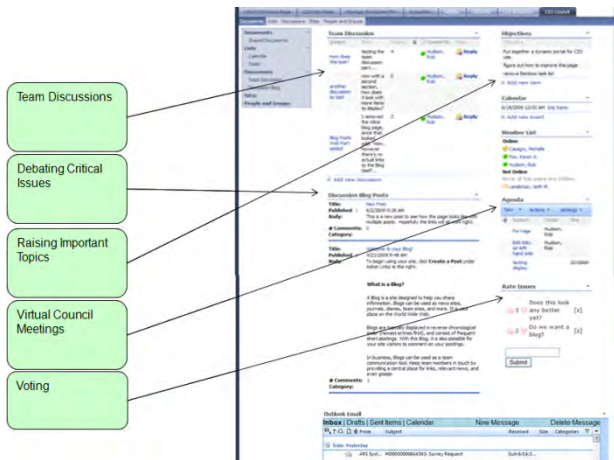


**Figure 4.  Using Blogs and Other Social Tools**

Figure 4 illustrates the use of blogs, social voting and other techniques to support the CIO's strategic business planning process.  In this example we show a vitual CIO council meeting where the CIO facilitates team discussions, debates critical issues, raises important topics, and takes opinions, surveys and "votes" on key issues.  Doing this "on-demand' in such a virtual fashion has allowed for more productive sessions during the formal face-to-face meetings the council periodically holds.

The CIOweb environment creates a full-featured social computing platform, where stakeholders will find new methods of collaboration and communication, which in turn will facilitate improved decision-making through better understanding and user involvement.  Stakeholders will enjoy increased situational awareness through techniques such as dashboard analytics utilizing tools to measure and identify value.

Concurrent to this activity, Mikro was created as a prototype platform for the MITRE and Army -funded Micro Situational Awareness (MicroSA) research program.  The primary goal of the MicroSA program was to improve the timeliness and completeness of situational awareness across the enterprise through the publication of concise, ad-hoc messages to describe changes within & affecting the enterprise.  These messages, published as events occur and containing only the updating information, would enable operators and systems to share alerts concerning themselves, their duties, and the assets they control and monitor.  Then, through high levels of visibility and accessibility of the messages, operators & systems would be able to receive content relevant to individually-expressible needs as events unfold.

The work program itself investigated means for publishing, advertising, and disseminating ad-hoc, concise messages in a manner supporting both the publisher's need for simplicity as well as the consumer's need for discovery.  Maintenance of publication simplicity was a significant goal as successful employment of message sharing in this space requires frequent sharing by the entire community as well as high levels of flexibility in data entry.  Consumer discovery effectiveness then focused primarily on meaningful expression of user needs with reliable discovery and delivery of content regardless of the author.  Enabling versatile machine-to-machine information access was core to consumer discoverability because enterprise services also act as consumers.  Finally, improving the trustworthiness of the system was a significant requirement as use of informal messages at this level carries a level of risk which must be mitigated.

The functional result of this program is Mikro, an enhanced micro-blogging web application, service suite, and framework illustrated in Figure 5 created to prototype, validate, and refine the program research concepts. It offers powerful search, subscription, and exploration features that enable users to locate and to receive content based on a variety of complex criteria, including attributes and content concerning the messages as well as the author.  The free text nature of the messages exchanged allows the service to transmit content of all varieties, thereby adapting to the conventions of the community, and the use of regular, open protocols makes integration with other systems simple.  This system also incorporates a hybrid authentication capability, one aspect of which allows enterprise directory services from multiple enclaves to be used to validate personnel identities and to populate user information.
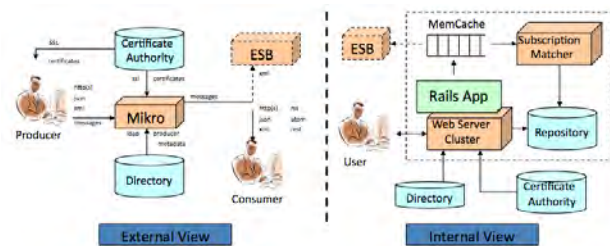


Figure 5. Mikro system view

## 6. FUTURE WORK

Looking ahead, there is still much to be studied to fully understand the challenges we highlighted in this paper and to investigate how to achieve main-stream adoption of Enterprise 2.0 capabilities as they mature across a DoD enterprise.  Future work can be focused in the following areas:

- Continuing socialization process of Enterprise 2.0 technologies across the organization
- Making these technologies available, side by side with legacy tools, and let the user see first hand, the benefits of transition
- Establishing the governance framework to support technology transition
- Working with program managers to use the capabilities (gaining bottom up advocacy)
- Piloting rapid development and operational transition of CIOWeb
- Moving beyond the testbed stage and providing operational capability for assessment

Specific objectives for the upcoming year will include defining an organization-wide approach for our sponsoring CIO to guide the adoption of Enterprise 2.0 and enhanced collaboration technologies across the enterprise. This will include a more detailed assessment of the future impact of these technologies as well as a Web/Enterprise 2.0 Networking Analysis and Technology Investment Plan. In addition, several additional spirals of CIO Web and Mikro capabilities are planned to provide enhanced collaboration capabilities to more users across the enterprise.

# 7. CONCLUSIONS

In summary, the case study initiatives we have discussed show promise. As we have discussed, there are many challenges associated with the main-stream adoption of Enterprise 2.0 capabilities across the DoD enterprise. The case study initiatives show specific examples of how such technologies can be exploited in a DoD environment, and we feel that harnessesing the value of Enterprise 2.0 can provide the following benefits:

- Creates a more agile, responsive and cost-effective IT department
- Embraces and empowers users, doesn't restrict innovation
- Provides new ways of collaboration and communicating
- Supports better decisions made through understanding and involvement
- Creates full-featured social computing platform
- Utilizes tools to measure and identify value
- Emphasizes the importance of measurement and analytics and brings them to the forefront of awareness and decision making
- Identifies stakeholders and helps understand/evaluate stakeholder behavior
- Encourages education, understanding and adoption of IT guidelines and policy

Like many commercial organizations, DoD CIOs play a crucial role in leading the enterprise to accomplishing or exceeding its business goals. To maximize business success given limited resources it is important that the CIO clarify enterprise business objectives, and define an enterprise strategy for the organization to meet those objectives. Putting strategic products in a wiki, provided an easy way to share the plan across the organization and offer everyone a mechanism to take part in building and realizing it. Enterprise 2.0 technologies, such as the wiki and the dynamic services for the dashboard capability became enablers to helping the CIO execute the IT governance necessary. Having the CIO embrace those technologies facilitated the social adoption by the entire organization, which ultimately helps to increase the credibility and influence of the CIO role.

The key takeaways from this work thus far include:

- DoD organizations are in the midst of a collaboration transformation
- Successful communities collaborate and work interactively
- Generation-Y's are driving much of this transformation
- Applications should be built to share data
- Adoption of these technologies takes a mindset change
- Measurement is key

As part of measurement, there is a need to rethink traditional analytics to accommodate social networking. Social analytics are based on different values, such as Peer review and recognition, stake holder voting, and techniques to capture corporate knowledge and discussions.

To help increase the chance of mainstream adoption of enterprise 2.0 capabilities, the key is to identify a business sponsor who has a vested interest in driving value, and is willing to transform common practices in new ways to empower users, encourage feedback and participation, and set the policy/guidance to do so.

# 8. REFERENCES

[1] S. Andriole, Web 2.0 Future: CIOs Wrestle with Old Issues of Control, Cutter Consortium Business Intelligence Executive Report, Vol. 8, No 7, 2008.

[2] R. Cherinka, R. Miller and J. Prezzama, CIO 2.0: Reshaping the role of the CIO in an Enterprise 2.0 Environment, World Multi-Conference on Systematics, Cybernetics and Informatics (WMSCI), July 2009.

[3] R. Cherinka and R. Miller, Lessons Learned in Using Web Services for Enterprise Integration of Complex Systems in the Department of Defense, International Conference on Systematics, Cybernetics and Informatics (SCI), July 2004.

[4] R. Cherinka and R. Miller, Engineering a Complex Information Enterprise: A Case Study Architecting the Department of Defense Hourglass, 2007 International Conference on Enterprise Information Systems and Web Technologies (EISWT-07), July 2007.

[5] S. Cramm, Circa 2015: The CIO of the Future, Valuedance White Paper, September 2008

[6] R. Howard and L. Liu, The CIOs Guide to Harnessing the Value of Enterprise 2.0, CIO.com Webcast, www.cio.com, 2009.

[7] S. Overby, How to get Real about Strategic Planning, CIO.com Report, www.cio.com, Jan 2008.

[8] Val Sribar, Enterprise Lead Solutions Presentation, Gartner CIO Leadership Forum, January 2009

[9] The Internet Grows Up: Web 2.0 Moves from Social Networking into the Business World, an ACS: Expertise in Action White Paper, ACS Inc. Feb 2009.

[10] W. Jackson, Invasion of the botnets: Syberattacks on the rise, government Computer News, August 31, 2009

[11] C. Clark, Mobile work is the „New Norma', CIO, September 15, 2009.