Collaborative Environments.
Considerations Concerning Some Collaborative Systems

Mihaela I. MUNTEAN
West University of Timişoara, Romania
mihaela.muntean@feaa.uvt.ro

It is obvious, that all collaborative environments (workgroups, communities of practice, collaborative enterprises) are based on knowledge and between collaboration and knowledge management there is a strong interdependence. The evolution of information systems in these collaborative environments led to the sudden necessity to adopt, for maintaining the virtual activities and processes, the latest technologies/systems, which are capable to support integrated collaboration in business services. In these environments, portal-based IT platforms will integrate multi-agent collaborative systems, collaborative tools, different enterprise applications and other useful information systems.

Keywords: *collaboration; collaborative environments; knowledge management; collaborative systems; portals; knowledge portals; agile development of portals.*

1 General Considerations

In the present global economy, strongly influenced by IT and information systems evolution, the modern organizations try to face the challenges by adjusting strategies and restructuring activities, for aligning them to the new economy requirements. New business models are developed, capable to stand for the e-business phenomena, open wide to potential clients and business partners.

Collaboration becomes a business strategy, aiming the activities/processes optimization within different workgroups, between these at organization level or between connected organizations, with the purpose to assure a competitive advantage in the challenging environment [30]. For an effective collaboration, nowadays, people work in large virtual teams, spread around the world, including colleagues, clients, customers and different partners. By the level of these groups, different projects of common interest are initiated; projects of short or long term, which in time develop to common competitive businesses [28].

It is certain, that *the competitiveness of the enterprises will depend on their capacity to pass from the hierarchical and individual character of the workplace to the promotion of a collaborative work*. The evolution of information systems in these collaborative environments led to the sudden necessity to adopt, for maintaining the virtual activities/processes, *the latest technologies/systems, which are capable to support integrated collaboration in business services* [14]. Stating this, we mean collaborative systems like conversational tools, meant to support socializa-

tion and sharing of knowledge at community level, collaborative systems based on software agents; *all these*, beside various enterprise applications, *will be integrated in portal-based IT platforms*.

It is obvious, that all collaborative environments (workgroups, communities of practice, collaborative enterprises) are based on knowledge and between collaboration and knowledge management there is a strong interdependence [2] [19] [23].

Setting out from these presumptions, *we developed a scientific approach around the knowledge portal* by proposing *agile development based on prototype technique combined with MDA attributes*. Within an original theoretical approach, we defined agile development in terms specified above, substantiating the life-cycle phases of product development. In addition, we have a practical initiative concerning a real knowledge portal anchored in an effective development project. It has to be mentioned the fact that the presentation of the portal functionalities implementation is sustained both by the PIM and PSM model with actual references to the Three-Tier architecture of the portal. Future concerns could aim the approach of the sustaining processes׳ functionality, so that the collaborative community could be extended to organizational level.

2. Collaborative Systems, Tools and Technologies

All these systems sustain collaboration and contribute decisively to the consolidation of virtual collaborative communities of different types -

workgroups, practice communities, collaborative enterprises [12] [17]. Taking into account the specific characteristics [24] [25], we will point out personal remarks regarding the conception, design and implementation of some collaborative systems:

- **Multi-agent collaborative systems development** occurs according to some specific methodologies, the model-oriented approaches proving their efficiency [1] [20] [21] [22] [29].
- **Collaborative tools development** can be simplified by appealing to the open-source market; there are some solutions for sustaining on-demand collaboration anytime/anywhere [7] [8] [18] [32].
- **Portals development methodologies** comply with system's general development methodologies [3] [5] [10] [16] [26] [31] [33] [34], but there are only few significant marks related to this subject [6] [9] [13]. In our opinion, portal development can underlie on the principles of component reuse, standard sub-portals representing elements that could decisively contribute to optimize the development life-cycles of these systems.

In collaborative environments, portal-based IT platforms will integrate multi-agent collaborative systems, collaborative tools, different enterprise applications and other useful information systems.

Although enterprise applications and corporative portals are separate initiatives, an unexpected synergy is realized, when enterprise applications are integrated in the collaborative business community portal:

- at collaborative environment level is accomplished an unitary modeling for all business processes taking into account the ERP applications philosophy;
- the adoption process of ERP products by members of the collaborative community is speeded up, contributing to the augmentation of ROI of the whole collaborative platform;
- the portal platform enhances the visibility of the ERP systems specific content for the whole collaborative community;
- ERP, CRM or SCM applications, which are usually adopted for internal audience, could be externalized through the portal, offering to partners and loyal clients access to the developed business;
- an unitary training of all portal platform users could be realized, including the specificity of the enterprise applications.

We consider that such an approach is necessary for supporting all collaborative e-business processes. On the other hand, in global economy, sustaining the value chains presumes the integration of loyal clients, suppliers and different partners within the extended collaborative enterprise. In this context, the integrated and collaborative platform:
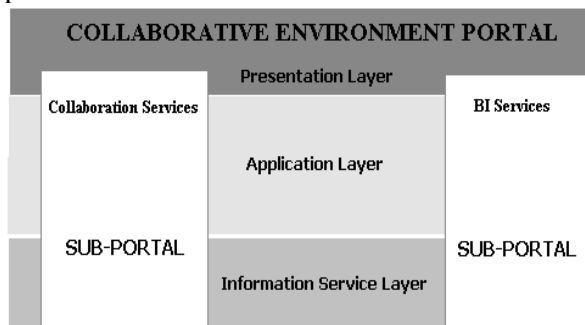

Fig. 1. Portal solution based on sub-portals

- offers to all extended community members an unique, personalized and based on user roles access to the multitude of integrated systems and applications (including ERP, SCM, CRM and HR enterprise applications); in the last years the development of some access facilities of the remote portal by means of some mobile devices and vocal systems has been observed; regarding the mentioned enterprise applications, these could be made up themselves in real sub-portals, followed by their integration in the unitary portal platform of the collaborative environment;
- promotes dynamic and efficient communication, including virtual collaboration spaces, sustained by a series of collaboration tools;
- allows modeling and business process deployment in dynamic environments, their sustaining applications covering up the whole value chain;
- offers the information/knowledge as well as the necessary tools for taking the appropriate decisions in the shortest period of time to the users in charge of making the decisions; by means of some dedicated portlets, the integration of some Business Intelligence models is possible, which sustains the decision processes at every level;
- at the level of the collaborative enterprises, a collaborative management is promoted, the decision making processes being marked by this desideratum.

3. Agile Development of Portals
The agile development (The bases of agile development are grounded in [27]) framework (figure 2), which proposes the use of prototype technique

enriched with MDA specific attributes, is pro-   vided with the following phases:
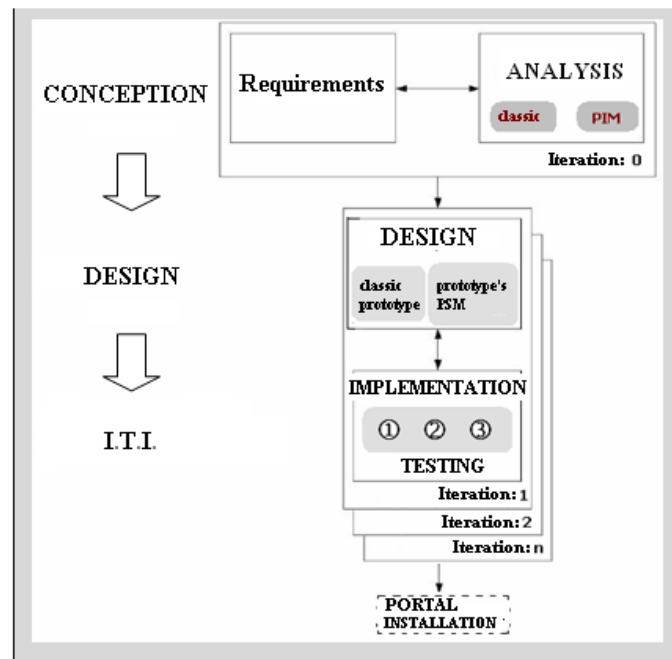

Fig. 2. Agile development of portals

- **<Conception>**: at this level the PIM model elaboration is targeted, according to the requirements of the knowledge based collaborative community; prior, a feasibility study is made in order to justify the efficiency and efficacy of the project, also elaborating a business plan to demonstrate if the project brings a measurable benefit or not; the modeling of the requirements will lead to outlining the functionalities of the portal, of the user communities, all these being represented at a level of PIM model;
- **< Design>**: targets the elaboration of the PSM model specific for the portal prototype, i.e. the finalization of the architecture of this model, taking into account all details regarding the IT infrastructure, which must sustain the unitary, integrating vision of the PIM model. The building of the PSM model will take into account the future implementation solution of the prototype, by relating the model to a certain IT platform and to certain maintaining technologies;
- **< I.T.I >**: has the goal to implement the portal prototype according to the PSM model, followed by the testing of the prototype. Often, as a result of testing its functionality, the prototype invalidation leads to the revision of the PSM model and aims at correcting some aspects related to technology and the considered IT platform. Practically, the final version of the portal prototype is obtained by an iterative process,

which regards the adjustment of the PSM, its implementation and the testing of the prototype solutions for verifying the imposed requirements. The validation of the prototype leads to the portal installation and its transfer to the users that possess the knowledge of the collaborative community.

We consider that, by this theoretical approach, we could substantiate a possible direction to be followed in rapid portal development, a direction which could be also applied to many other information systems. After a strict theoretical foundation the proposal has been applied within a real collaborative Knowledge Portal development project.

4. Collaborative Capabilities of the Knowledge Portal

For remaining competitive, the modern business organization must create a fortunate environment for developing KM processes and sustaining the knowledge life cycle. During its evolution, the portal technology proved to be an IT infrastructure with collaborative valences, which concur to the building of knowledge based organization. We propose the following basic functional architecture (figure 3) for a collaborative knowledge portal, having as an objective to facilitate the access to the knowledge base (as part of the organizational knowledge, which has been transposed to the portal) of the collaborative commu-

nity members, the knowledge exchange between them and generally to provide a knowledge flow in the whole virtual community.

Among the functional components of the knowledge portal we will highlight the following four major categories: process support, collaboration, content management and personalization (Note. The four major functionalities (content/document management, collaboration, process support and personalization), guide to the outlining of the service oriented architecture, unlike other functionalities, which only provide the operation of the portal in the imposed parameters or, indirectly, sustain these four.)
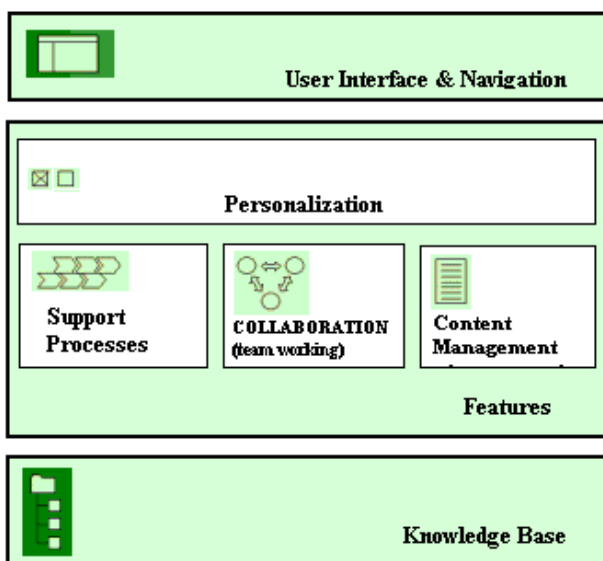

Fig. 3. The functional architecture of a knowledge portal [15]

The portal incorporates, horizontally, different collaborative tools [19]. These sustain knowledge management and intervene in different stages of KM life cycle.

It's obvious that collaborative tools concur decisively to the creation of new knowledge, on-line "conversations" helping to refine this knowledge and thus generating pieces of knowledge relevant for the organization:

- the e-mail remains one of the most common communication tools in business, at the level of the collaborative environment being necessary to establish a management politics for the messages propagated like this;
- the chat can be seen like a virtual space for voluntary and un-moderated discussions;
- the Internet forums are web applications for hosting discussions and advertising content generated by users [35];
- the electronic conferences provide the means of bringing people together, enabling easy sharing

of ideas;
- the groupware supports and speeds up the activities that are common for workgroups [11];
- the blog (personal or corporatist Web journal) – a needful tool for communication at the level of work-teams in a project or practice community) operates based on practices of the storytelling type;
- the wiki, a system that is open to knowledge exchange, offers editing facilities and collaborative content management to the members of the virtual community [7];
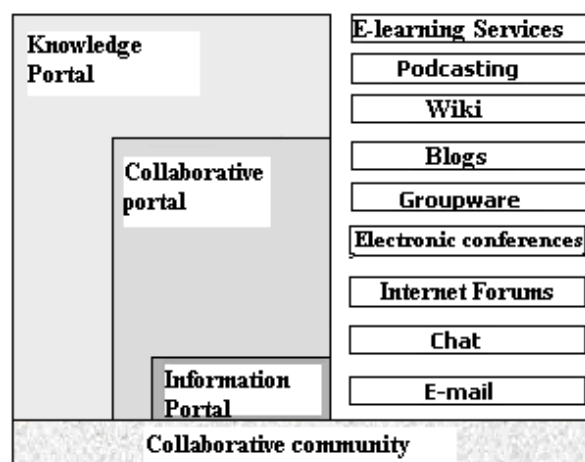- podcasting represents a method for sharing media files etc. on the Internet.

Fig. 4. Portals & Collaboration facilities (adapted from [4])

The knowledge portal, a top representative of portal technologies, represents a concrete IT solution of knowledge management, which was formed, according to Firestone, from the informational portal solution through the building of intelligent sustaining capacity of the whole life cycle KM (In 2000, Firestone defines the knowledge portal as a solution of support portal of e-business processes in a collaborative (and/or extended) knowledge based organization. In the next years he improves the technical architecture of the portal of type EKP (Enterprise Knowledge Portal) by optimization of the AKS structure and the introduction of intelligent agents, by which the implementation of a distributed knowledge management strategy is possible), including the help of competitive collaborative tools.

Taking into account SOA philosophy, all these tools will be integrated with special portlets, as services in the portal architecture and will be provided to the collaborative community users [19].

At the big enterprises level, a unique portal solution with centralized services is difficult to man-

age and maintain; it is recommended to use an IT infrastructure based on a federative model which provides the interoperability between different communities/workgroups (In 2004 IBM develops, by means of the facilities offered by the WebSphere Portal Server, the first solution of federative portals for business environment.). We propose a solution based on a primary interface portal (for the type of top-manager users or users with equivalent rights) and a series of departmental portals (figure 5) having their own knowledge bases and on which specific applications are running (for the members of those communities). The top-manager is offered a vast range of services, some of them integrated through the local portlets, the others through the remote portlets in the departmental portals. The collaborative tools can be locally implemented by the level of each portal or an appropriate remote portlet server can be chosen. This (WSRP producer) will offer to everyone Web services for on-line synchronous or asynchronous communication, which will be called on from distance anywhere within the federative model.
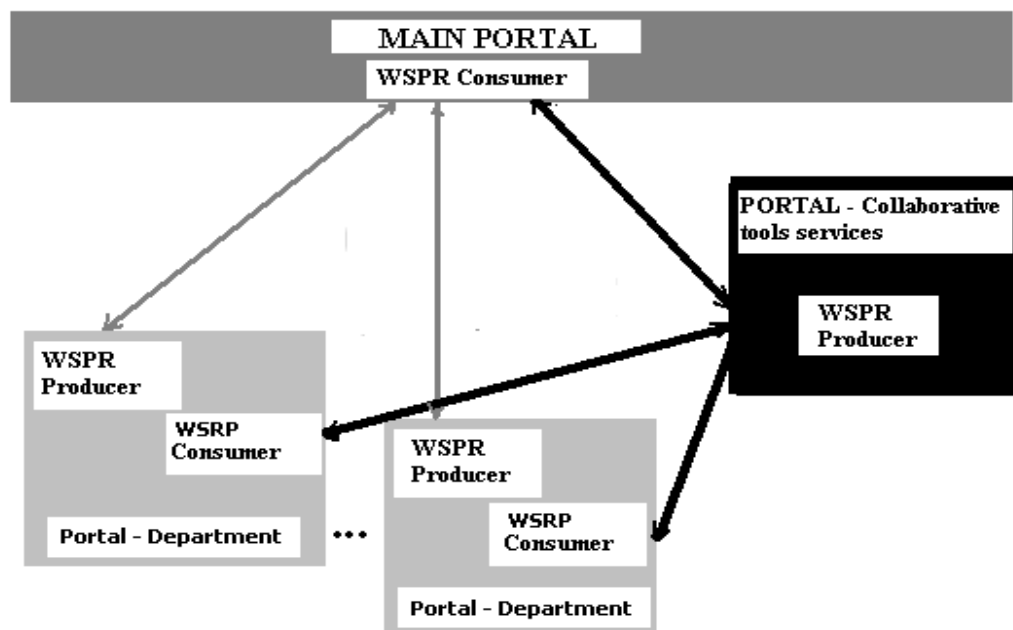

Fig. 5. Federative portals. Implementing collaborative tools

The federative model involves separately administrated portals, so that every portal could be a remote portlet producer (WSRP producer) for others, a consumer of such portlets (WSRP consumer), or could have both roles.

Summing up, the federative portals are distributed (remote portlets on different systems localized on distance), very low connected (from the point of view of the autonomy of the remote portlet server towards the portals that call the WSRP services), collaborative (the remote portlets can communicate and share information/knowledge), plug-and-play (easy use and locating of the remote portlets) and standardized (they are viable due to the facilities offered by the WSRP, SOAP, WSDL, SAML, SAML, UDDI and WS-Security standards). WSRP (and the other mentioned standards) together with JSP 168, allow an innovative approach of the SOA architectures [20] [21] [22], the federalization of complex services, offered in a single frame, being necessary for a better maintenance of these services in a complex

environment.

5. Conclusions
According to the particularities of the collaborative organization/community (the size of the organization; working requirements etc.) managers will have to choose between a solution of a unique portal or a solution based on a federative model. The federative portals support the communication and knowledge/information sharing by the capacities of the remote portlets.
The collaborative capacities of a knowledge portal consolidate the support of the KM life cycle and sustain the strategy of the organization for innovation and achievement of economic performances by generating knowledge. Every collaborative tool presented above has its own role inside the community; the collaborative tools palette will be established depending on the requirements of the virtual community members.
Collaborative communities represent a real solution for enterprises that wish to remain competi-

tive in the business environment. Being entirely or partly transposed in the virtual environment, they have to adopt a flexible business strategy, to make decisions based on knowledge, which regards the consumers, suppliers, shareholders, investors or even competitors. *The collaborative systems, tools and technologies sustain work teams, collaborative communities and enterprises, portal based IT platforms proving their efficiency as infrastructures of the considered environments.*

For Romania, the relevance of collaborative enterprise concept comes from our country engagement in the evolution to the informational society - knowledge society, a condition of lasting development and consolidation of its european and euro-atlantic integration. It would be wrong to consider, that collaborative (knowledge based) organization/enterprises would represent only a future problem or it would represent an exaggerated approach.

References

[1] Shag. (2005) Agenţi software. Available: file:///F:/AGENTI/Shag%20-%20 Agentii%20software.htm

[2] M. Alavi and D. Leidner, "Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues," *MIS Quarterly*, vol. 25, no. 1, 2001.

[3] J. Arlow and I. Neustadt, *UML and the Unified Process – Practical Object-Oriented Analysis and Design*, Boston: Addison-Wesley, 2002.

[4] J. Barette, "Deploying the Next Generation of Enterprise Portals," *DM Review*, vol.13, no.2, 2003.

[5] C. Brândaş, *Sisteme suport de decizie pentru managementul performant*, Timişoara: Editura Brumar, 2007.

[6] C. Brosché, *Designing the Corporate Portal – A Master's Thesis*, Gotteborg: Volvo Information Technology, 2002.

[7] S. Buraga, *Programarea în Web 2.0*, Iaşi: Editura Polirom, 2007.

[8] S. Buraga, "Orizonturi Web," *Conferinţa Internetics*, 2008.

[9] H. Collins, *Enterprise Knowledge Portals. Next Generation of Portal Solutions*, Amacom, 2003.

[10] N.D. Davidescu, *Proiectarea sistemelor informatice prin limbajul Unified Modelling Language*, Bucureşti: Editura All Beck, 2003.

[11] D. Fotache, *Groupware. Metode, tehnici şi tehnologii pentru grupurile de lucru*, Iaşi: Editura Polirom, 2002.

[12] A. Giboin, R. Dien, L. Karsenty and G. De Michelis, "Designing Cooperative Systems. The Use of Theories and Models," *Proceedings of the 5-th International Conference on the Design of Cooperative Systems (COOP'2000)*, 2000.

[13] A. Guruge, *Corporate Portals. Empowered with XML and Web Services*, Digital Press/Elsevier Sciences, 2003.

[14] P. Harmon, M. Rosen and M. Guttman, *Developing E-Business Systems and Architectures. A Manager's Guide*, San Diego: Academic Press, 2001.

[15] C. M. Jansen, V. Bach and V. Osterle, "Knowledge Portals: Using Internet to Enable Business Transformation," *Proceedings of INET 2000*, 2000.

[16] I. Lungu, Gh. Sabău, M. Velicanu and M. Muntean, *Sisteme informatice. Analiză, proiectare şi implementare*, Bucuresti: Editura Economică, 2003.

[17] M. Marakas, *Decision Support Systems In The 21st Century*, Prentice Hall, 2003.

[18] A. Marcus and D. Coleman, "The Future of Collaboration," *Collaborative Strategies LLC*, 2006.

[19] M. Muntean – coord., *Collaborative Information Systems in the Global Economy*, Timisoara: Editura Mirton, 2005.

[20] M. Muntean and C. Muntean, "Collaborative Environments - A Framework for Business Intelligence," *WSEAS Transactions on Business and Economics*, WSEAS Press, 2006.

[21] M. Muntean, "Collaborative Business Environment Based on Federated Portals," *Annals of T. Popoviciu Seminar*, vol. 4, Cluj-Napoca, 2006.

[22] M. Muntean, *Sisteme multi-agent, Note de curs*, Timisoara: UVT, 2006.

[23] I. Munteanu and V. Ioniţă, *Managementul cunoştinţelor. Un ghid pentru comunităţile de practicieni*, Editura Cartier, 2007.

[24] S. Niţchi and R. Niţchi, "On the Paradigm of Collaborative Systems," *Proceeding of the International Workshop „Collaborative Support Systems in Business and Education*, Cluj-Napoca, 2005.

[25] S. Niţchi, R. Niţchi and A. Mihăilă, "Some Remarks on the Conceptual Level of A General Collaborative FrameWork," *Annals of „Tiberiu Popoviciu" Seminar*, vol. 6, Cluj-Napoca, 2008.

[26] D. Oprea, *Analiza şi proiectarea sistemelor informaţionale economice*, Iaşi: Editura Polirom, 1999.

[27] S. F. Pereiras, W. Tobias, M. Grzegorzek and S. Staab, *Semantisches Web Portal*, Landau: Koblenz Universitat, 2007.

[28] J. Pflaging, "Enterprise Collaboration: The Big Payoff," *KMWorld*, no. 1-4, 2001.

[29] G. Silaghi, *Collaborative Multi-Agent Systems. Conception, Design and Development*, Cluj-Napoca: Editura Risoprint, 2005.

[30] D. Skyrme, *Knowledge Networking: Creating the Collaborative Enterprise*, Linacre House, 2003.

[31] E. Turban and J.E. Aronson, *Decision Support Systems and Intelligent Systems*, New Jersey: Prentice Hall, 2003.

[32] C. Wagner and N. Bolloju, "Supporting Knowledge Management in Organizations with Conversational Technologies: Discussion Forums," *Webblog and Wikis*, 2004.

[33] H.J. Watson, G. Hoedeshel and R.K. Rainer,

R.K., *Building Effective Information Systems and other Decision Support Applications*, John Willey & Sons Inc., 1997.
[34] D. Zaharia and I. Roşca, *Analiza obiectuală a sistemelor informatice*, Bucureşti: Editura DualTech, , 2003.
[35] http://en.wikipedia.org/wiki/Internet_forum

Mihaela I. MUNTEAN has graduated from the Faculty of Computer Science, „Politehnica" University of Timisoara in 1986. Currently, professor Mihaela I. Muntean is the chair of the Business Information Systems and Statistics Department at the West University of Timişoara and an IT independent consultant. She is interested in information technology and knowledge management, her research activity results are published in over 70 papers in indexed reviews and conference proceedings. Now, she is teaching advances in database management systems, business intelligence, decision support systems, bringing important contribution to the foundation of higher education in Economic Informatics within the Faculty of Economics and Business Administration Timişoara.