Merlin White paper

CollabTools

The Merlin project addresses the increasing demand to find and discover new efficient ways to support collaborative embedded systems development. Embedded systems are increasingly developed globally in collaboration with partners, such as subcontractors, third party developers and also with in-house developers.

The Merlin project established working practices that build upon the benefits of collaboration but neutralise its negative effects. Central in this approach is the industrial application of technologies. No technology can be considered for industrial usage if there is no observed and proven experience of its benefit in practice. All Merlin results have been validated for applicability in specified industrial environments.

This white paper summarises one of the Merlin results. In case you are interested in more information on the project or you are interested in the full deliverable, please get in touch with us via the web-site: http://www.merlinproject.org/

Also we are interested in your opinion or feedback. Our contact details can be found on the Merlin web-site.

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Merlin
- E**m**bedded Systems **E**ngineer**r**ing in Co**l**laborat**i**o**n**

The Merlin Consortium consists of:

Incode, Ericsson, LogicaCMG, Lund University, Nokia, Philips, Solid, Sony Ericsson, TU Delft, University of Oulu, VTT Technical Research Centre of Finland

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TERMINOLOGY

Asynchronous communication /interaction

An interaction between group members is asynchronous if it does not require the participating group members to participate at the same time. (http://www.intranetjournal.com/glossary/)

Collaboration

Collaboration means that two or more entities work together to create mutual value. Collaboration involves two or more companies, departments or customers that combine their competencies and technologies to create new shared value while, at the same time, managing their respective costs and risks. The entities can combine in any one of several different business relationships and for very different periods of time, ranging from some duration needed to exploit a particular innovation or business opportunity, to a much longer term on-going relationship. Adapted from (Welborn & Kasten, 2003).

Communication /Indirect communication (Meade 2003)

The single most important key to effective collaboration is communication. Team communication can be divided into two classifications: direct and indirect. Direct communication consists of the obvious, commonly used forms of communication such as phone, email, etc. The type of communication required for a particular situation depends heavily on the time/place matrix as seen in Figure 2.

	Same time	Different time
Same place	1	2
Different place	3	4

Figure 2. Time/Place Matrix. (adapted from Schlichter et al. 1997)

Communications in quadrants 1 and 3 allow for the use of synchronous communications (e.g. phone, videoconference), while quadrants 2 and 4 require only asynchronous communication (e.g. email, voicemail, fax). Likewise, quadrants 1 and 2 allow for the use of location dependant communication (e.g. white boards, shared computer workstations), while quadrants 3 and 4 demand location independent communication (e.g. application sharing, Internet).
Indirect communications refer to the information transferred by observing the execution of a task. For a distributed team, this could include observing a shared artefact being changed, or an event driven notification. In both cases, a direct communication link between group members was not established; however, the transfer of information was conducted.

CSCW	CSCW is defined as “a generic term that combines the understanding of the way people work in groups with the enabling technologies of computer networking and associated hardware, software and techniques.” (Schlichter et al. 1997)
Groupware	A class of software that helps groups of colleagues (workgroups) attached to a local-area network organize their activities. Typically, groupware supports the following operations: scheduling meetings and allocating resources; e-mail; password protection for documents; telephone utilities; electronic newsletters; and file distribution. Groupware is sometimes called workgroup productivity software. (http://www.intranetjournal.com/glossary/)
Intangible asset	Property that is a right such as a patent, copyright, trademark, etc. or one, which is lacking physical existence, such as goodwill (Garner 1999).
Intangible property	Property, which cannot be touched because it has no physical existence such as claims, interests, and rights. This term means such property that has no intrinsic and marketable value, but is merely the representative or evidence of value, such as certificates of stock, bonds, promissory notes, copyrights, and franchises. (Garner 1999)
Intellectual property	Intellectual property is a design or an idea, which belongs to the person who invented it. The law prohibits others from copying it (Garner 1999).
Intellectual property rights, IPRs	General term for the assignment of property rights through, e.g., patents, copyrights or trademarks. These property rights give the holder the exclusive right to exploit the innovation. The holder thus has monopoly power on the use of the item, normally for a specified period of time and within a specific geographic area. This power allows the holder of an intellectual property right to restrict imitation and duplication of the product concerned. IPRs prevent free riding by other companies and constitute an incentive to undertake R&D efforts. (Garner 1999)
IOIS	Inter-organizational information system.
Joint venture (http://encyclopedia.thefreedictionary.com/)	A joint venture is a business relationship between two or more parties to undertake economic activity together. All parties agree to share in the profits and losses of the enterprise. The venture is for one specific project only, rather than for a continuing business relationship as in a strategic alliance. Joint ventures are often co-operations between a local and foreign company. A joint venture is often seen as a very viable business alternative in this sector, as the companies can compliment their skill sets while it offers the foreign company a geographic presence.

Licensing	"In licensing agreements a company is granted the right to use a specific patented technology in return for a payment. Licensing is a relatively cheap and fast way to acquire a technology. Licensing may be used when capital is scarce, when important restrictions forbid any other means of entry, when country is sensitive to foreign ownership, or when it is necessary to protect patents and trademarks." (Duysters and Hagedoorn 2000)
Original equipment manufacturer (OEM)	"A designation for companies that manufacture equipment that is then marketed and sold off to other companies under their own names." (http://www.ocmtech.com/resources/glossary.cfm)
Original software component manufacturing (OCM)	Software components produced in strategic partnerships (Seppänen and Helander 2001).
Partnership	"A relationship resembling a legal partnership and usually involving close cooperation between parties having specified and joint rights and responsibilities." (Webster's Ninth New Collegiate Dictionary 1990) It can range from hierarchical structure to forms of cooperation that come to very close to standard market transactions. (Duysters and Hagedoorn 2000)
SCM	SW Configuration Management. NOTE: From terminological point of view, term "SCM" is used in manufacturing industry also to denote Supply-Chain-Management. Therefore, it is necessary to be cautious with terminology when reading articles related to the product information management in the context of manufacturing industry.
Synchronous communication / interaction	An interaction between group members is synchronous if it requires the participating group members to participate at the same time. (http://www.intranetjournal.com/glossary/)
Technology exchange	Technology exchange is a loose form of collaboration. It can be technology sharing agreements, cross licensing and mutual second sourcing. This can take several organizational and legal forms. (Hagedoorn 1990)

1. INTRODUCTION

The purpose of this document is to summarise results of tool inventories performed during Merlin project. The results are two-fold. First part (section 2) of the document contains tools that can be used to support collaboration in general and the second part (section 3) software tools that enable collaborative software development.

Tools are presented in tables. Each tool table includes five cells, their meaning is specified below.

Tool:	Name of the tool.
Company:	The manufacturer of the tool.
Description:	
In this cell there is a short description about how tool works and what features it includes.	
Installable / Web based:	Tool can be fully web based, when no installation is required to the client computer. On the other hand, tool can require installation also to the client computer. Price of the tool is also presented here, if it could be found from manufactures web site
URL:	Web address to the manufacturer's web site can be found here.

2. GENERAL TOOL SUPPORT FOR COLLABORATION

According to Coleman (Coleman 2003) a functional taxonomy of collaborative solutions can be defined as follows:

1. Collaborative Content Management Systems (LMS, LCMS).
2. Tacit Knowledge and Intellectual Capital Management.
3. Real time collaboration tools (RTC) (audio/video/data conferencing).
4. Virtual Team Tools (DPM, virtual team and process-oriented tools).
5. Collaborative CRM (customer resource management) cCRM.
6. Portals and On-Line Communities.
7. Unified and wireless messaging infrastructures for collaboration.

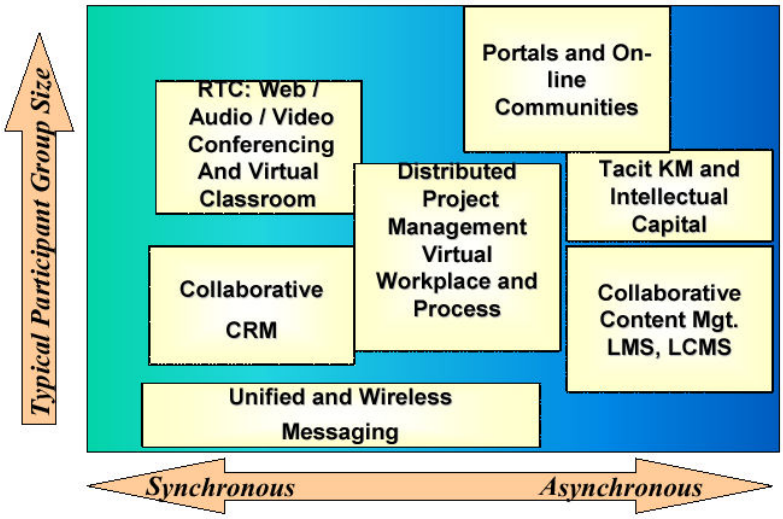


Figure 1. Functional taxonomy of collaborative strategies. (Coleman 2003)

Coleman's (2003) approach to systematizing collaboration has products or services in categories based on the major functionality of the product. Categories are not mutually exclusive, but many tools have functionalities fitting also to other categories. The seven categories cover wide range of technologies. Sample tools for these categories are presented in the following sub-sections.

2.1 TAXONOMY OF GENERAL COLLABORATION TOOLS

2.1.1 Collaborative Content Management Systems (LMS, LCMS)

CMSs allow end-users (typically authors) to create new content in the form of documents. These documents may be entered as a plain text or perhaps with a markup to manage document layout and the structure.

The systems also often include some sort of concept of the workflow for the target users, which defines how the new content is to be routed around the system.

A good example of a CMS would be a system for managing a newspaper. In such a system the reporters type articles into the system, which stores them in a database. Along with the article the system stores attributes, including keywords, the date and time of filing, the reporter's name, etc. The system then uses these attributes to find out, given its workflow rules, which should proofread the article, approve it for publication, edit it, etc. Later the editors can choose which articles to include (or ignore) in an edition of the newspaper, which is then laid out and printed automatically. (http://en.wikipedia.org)

Tool:	**Documentum**
Company:	Documentum Inc. & EMC Corporation
Description:	
Documentum 5 is an enterprise content management (ECM) platform. Packaged solutions, called Documentum Editions, are available for enterprise document management, compliance, collaboration, digital asset management, and Web content management. The Documentum WCM solution eases and automates the complex processes for creating, managing, and publishing Web content in multiple languages and locales. It provides Web teams with the tools they need to focus on site design and functionality and handle the technical requirements of managing content on complex, global Web sites.	
URL:	http://www.documentum.com

Tool:	**iManage**
Company:	Interwoven, Inc
Description:	
iManage WorkSite is an integrated application suite that combines document management, collaboration, portal access, knowledge management, workflow and business process automation in a single solution on a scalable and secure Internet platform. WorkSite can be deployed within a department, business unit or company as an Intranet solution, and extended to partners and customers as an Extranet solution. iManage uses standards-based technology.	
URL:	www.imanage.com

Tool:	**IBM DB2 Content Management**
Company:	IBM Corporation

Description:
IBM content management helps manage, share, integrate and deliver critical business information on demand. IBM software and solutions support many information types: images, documents, reports, e-mail, web content, e-records, multimedia, computer report output and more. The integrated, comprehensive content management portfolio assists organizations that must improve productivity, enhance responsiveness, and meet the demands of regulatory compliance.

URL:	http://www-306.ibm.com/software/data/cm

Tool:	**TotalLMS**
Company:	SumTotal Systems, Inc.

Description:
TotalLMS is an enterprise-wide, globally scalable application for managing learners, content, and resources. Organizations can centrally prescribe personalized training to individuals, while segmenting functionality and data based on organizational structures such as location, department, or customer. TotalLMS provides unparalleled levels of functionality and support for any blend of delivery environment: self-paced Web, live interactive Web, instructor-led courses, on-the-job training, seminars, mentoring and written documentation.

URL:	http://www.sumtotalsystems.com

Tool:	**Saba Enterprise Learning**
Company:	Saba

Description:
Saba Enterprise Learning is a management system that improves the skills and knowledge of people across the extended enterprise. Saba Enterprise Learning delivers the deep and comprehensive solutions for sales and channel readiness, channel certification, customer education, regulatory compliance and corporate universities, across global industries. Built on an open, scalable and configurable J2EE technology platform, Saba Enterprise Learning delivers the fast time-to-value and lower total cost of ownership while addressing multiple business needs. Rather than spending valuable time and resources on customisation, user can tailor the system to meet her needs through administrative options and configurable business rules.

URL:	http://www.saba.com/

Tool:	**Generation21**
Company:	Generation21 Learning Systems

Description:
Generation21 Enterprise is a fully integrated, "end-to-end" enterprise learning system. It combines robust LMS and LCMS functionality with our browser-based content development tool. Generation21 Enterprise supports both online and classroom-based learning. Its patent-pending "Universal Knowledge Object" technology delivers "nuggets" of information to employees on the job, where most learning actually occurs. Using Generation21 Enterprise, workers can retrieve "nuggets" of information instantaneously.

URL:	http://www.gen21.com/

Tool:	Konesa
Company:	CanyonBlue Inc.
Description:	
CanyonBlue's Konesa enables true team development by coupling a realtime collaborative platform with UML modeling capabilities to improve team productivity in the development lifecycle. Utilizing CanyonBlue's powerful realtime collaboration features, development teams are able to share and work in a single UML model regardless of tangible boundaries maintaining vision-focused interaction. Konesa is scalable across organizations, leveraging the powers of realtime collaboration and artifact reusability to meet the needs of developers, teams and the enterprise.	
URL:	http://www.canyonblue.com

2.1.2 Tacit Knowledge and Intellectual Capital Management

By definition, tacit knowledge is not easily shared. One of Polanyi's famous aphorisms is: "We know much more than we can tell." Tacit knowledge consists often of habits and culture that we do not recognize in us. (http://en.wikipedia.org).

The growing discrepancy between market value and book value of a corporation is largely attributed to intellectual capital, the intangibles of the business that underpin future growth. Intellectual capital includes assets such as brands, customer relationships, patents, trademarks and, of course, knowledge. Traditional accounting methods look backwards into the past and measure physical assets only. New methods must be established to measure intellectual capital. (http://www.knowledgepoint.com.au).

Tool:	Tacit software platform
Company:	Tacit Software, Inc.
Description:	
By automating the way people share expertise and relationships in the enterprise, the Tacit platform accelerates the fundamental business processes upon which business competes. *Tacit ActiveNet Application* ActiveNet provides a complete, out-of-the-box solution for automated expertise discovery, enterprise Q&A, and continuous knowledge-capture. ActiveNet is a lightweight configuration that integrates into existing infrastructure with minimal effort from IT. ActiveNet is suitable for departmental deployments and can flexibly expand and scale as needed in the future. *Tacit Server Platform* The Tacit Server Platform provides the foundation for the ActiveNet application as well as a platform for application development. The server includes the core enabling technology for automated discovery and continuous learning of employee expertise and business relationships in the enterprise. The combination of expertise sharing and relationship networking enables companies to quickly connect employees to each other for solving complex problems, satisfying urgent customer requests, and completing time-critical tasks. The Tacit Server Platform is designed to be self-sustaining and low-maintenance: there is no client software to deploy, a taxonomy-free architecture minimizes IT overhead; and patented, automation technology eliminates user upkeep of expertise and relationship profiles.	

Tacit Developer Tools Tacit Developer Tools provide easy access to all of the powerful expertise sharing and relationship networking capabilities of the Tacit Server Platform. Featuring Java-based APIs, the Tacit Developer Tools enable customization or creation of new interfaces, integration of Tacit technology into new or existing applications, and the development of new connectors for the Tacit Server Platform. *Tacit Connectors* Through Tacit Connectors, the Tacit Server Platform mines archived content and analyzes ongoing communication streams to continuously understand enterprise activity and to accurately connect the right people to each other. Tacit offers Connectors for corporate e-mail, file system, and collaboration tools such as Lotus Notes, Groove, and Documentum.	
URL:	http://www.tacit.com

Tool:	**ExpertCentral**
Company:	AllExperts.com
Description:	
ExpertCentral.com is a resource for people looking to contact experts in any field. It is the oldest and largest free Q&A service on the Internet.	
URL:	http://www.expertcentral.com/ Price: Free

Tool:	**Autonomy**
Company:	Autonomy Corporation plc
Description:	
The Autonomy Approach: Autonomy's products are built on the IDOL infrastructure. Autonomy's products offer a completely scalable, modular solution that enable customers to select technology according to their needs. IDOL Server is Autonomy's flagship product. It is a platform for understanding the meaning and significance of information: additional functionality can be seamlessly integrated with IDOL Server in order to perform advanced operations on that data. Using this off-the-shelf solution, organizations can process digital information automatically and communicate with multiple applications without the need for manual processing or meta-data. IDOL Server has a completely open architecture and is entirely data agnostic and scalable thereby allowing large organizations to manage vast quantities of information regardless of format or storage location.	
URL:	http://www.autonomy.com

Tool:	**Verity: Intellectual Capital Management Products**
Company:	Verity, Inc.
Description:	

Verity provides software that enables organizations to maximize the return on their intellectual capital investment. The company's intellectual capital management (ICM) solutions provide integrated search, classification, recommendation, monitoring and analytics across the real-time flow of enterprise information, along with question and answer interfaces for effective online self-service. Other Verity ICM solutions capture content and drive automated business processes. Verity technology also serves as a core component of more than 260 applications from leading independent software vendors.	
URL:	http://www.verity.com

Tool:	**HelloBrain**
Company:	HelloBrain.com Corporation
Description:	
HelloBrain.com Corp. provides a virtual interface between customers and solution providers. This involves proprietary and confidential information such as business plans, technology innovation, product development, capacity improvement and cost reduction. HelloBrain was formed to enable the attainment of critical mass in complex product development by creating the world's first intellectual capital exchange for technology solutions. HelloBrain's intellectual capital exchange provides all of the necessary components of a classical exchange, including buyers and sellers, liquidity, a transaction infrastructure, pricing mechanisms, information disclosure, and trust. In addition, HelloBrain provides specific capabilities necessary for virtual, or Internet-based intellectual capital exchange for technology, including on-line collaboration, evaluation, verification, and delivery, as well as security, protection of intellectual property, and a natural on-line community.	
URL:	www.hellobrain.com

Tool:	**QPR Collaborative Management Software**
Company:	QPR Software
Description:	
QPR develops interactive software products that foster collaborative management in organizations. Planning, implementation, communication and commitment are the corner stones for collaborative management. With QPR products the world-class organizations commit people to objectives and processes. QPR seamlessly combines Balanced Scorecard (QPR Scorecard) and Process Management (QPR ProcessGuide) softwares into one Collaborative Management solution. QPR software allows you to define and communicate your corporate strategy and objectives on an entirely new level. It helps you to motivate your personnel to work for mutual goals by allowing them to share and examine the company's vision, strategy, financial and operational targets. QPR Collaborative Software enables personnel at all levels of your organization to identify their individual responsibilities and targets so that strategy becomes tangible in everyday operations. The easy-to-use development interface lets user implement her scorecards as user define them. QPR ScoreCard enables user to start enjoying the benefits of her Balanced Scorecard system from the first day of use.	
URL:	http://www.qpr.com

Tool:	mySAP
Company:	SAP
Description:	
mySAP ERP solution for enterprise resource planning provides end-to-end enterprise resource planning functionality for business analytics, financials, human capital management, operations, and corporate services. mySAP Business Suite is a family of adaptive business solutions optimizes users critical business processes, such as customer relationship management, product life-cycle management, supplier relationship management, and supply chain management.	
URL:	http://www.sap.com

Tool:	SSA Global Extended Solutions
Company:	SSA Global Technologies, Inc
Description:	
SSA Global offers robust core ERP solutions and a comprehensive family of best-in-class, modular solutions that will allow user to rapidly and cost-effectively implement and extend her ERP infrastructure. By expanding system functionality into high-ROI areas including: supply chain management (SCM), corporate performance management (CPM); customer relationship management (CRM); supplier relationship management (SRM); product lifecycle management (PLM), businesses can often realize substantial payback. These SSA Extended Solutions help user increase productivity by working more efficiently with key constituents such as vendors, suppliers, partners, and customers. Standard, "out-of-the-box" integration allows for applications to work together efficiently and encompasses business processes — creating opportunities for increased profitability. SSA Global continuously enhances these integration capabilities, so even when functionality is upgraded, there is no need for customers to maintain it. SSA Global offers user a single, integrated approach and one point of contact for all your core enterprise and extension software needs. User's own dedicated account manager will lead a team of domain experts to work with user to implement SSA ERP and SSA Extended Solutions that will streamline processes, develop insightful business intelligence, improve collaboration and increase agility.	
URL:	http://www-306.ibm.com/software/data/cm

Tool:	WebFOCUS
Company:	Information Builders
Description:	
WebFOCUS is a comprehensive and fully integrated enterprise business intelligence suite that delivers maximum power, performance, and scalability and provides the broadest range of features available today. With WebFOCUS, you can satisfy the diverse needs of an unlimited number of users and user types by providing reliable, manageable enterprise reporting and business intelligence capabilities. As a result, any user within and beyond your enterprise can access and integrate any data, from any source, and use it to better manage key areas of their jobs and your business.	
URL:	http://www.sap.com

2.1.3 Real time collaboration tools (RTC) (audio/video/data conferencing)

Tool:	**IBM Lotus Sametime**
Company:	IBM (Lotus Software division)
Description:	
Lotus Sametime is an enterprise instant messaging and web conferencing application sold by the Lotus Software division of IBM. Lotus Sametime provides enterprise instant messaging functionality, presence information, and web conferencing. It offers strong support for communications standards and standard protocols, including Session Initiation Protocol, SIMPLE, T.120 and H.323. Lotus Sametime also integrates with Lotus Notes. Because it was built from the ground up for business, Lotus Sametime includes the security features IT departments demand in an enterprise software solution: - ***Authentication***. Whenever a person logs on to Lotus Sametime, he or she is authenticated against the corporate directory. This gives everyone in your organization the confidence that the person on the other end of the chat is who he or she says he or she is. - ***Encryption***. Lotus Sametime encrypts chat conversations, which prevents anyone with unauthorized access to your network from reading a chat conversation. - ***Archiving***. As with paper- and email-based communications, many organizations find that their IM conversations are subject to compliance regulations (like Sarbanes-Oxeley in the United States). Lotus Sametime can maintain complete, auditable logs of all IM conversations, to help support your organization's compliance efforts.	
URL:	http://www-142.ibm.com/software/sw-lotus/sametime

Tool:	**ACT! – Contact & Customer Management Software**
Company:	Best Software SP
Description:	
ACT! is designed for individuals, sales professionals and sales teams sharing data or a virtually unlimited number of individual users.	
URL:	http://www.act.com Price: $119.95

Tool:	**Sprint Global ATM**
Company:	Sprint
Description:	
Sprint Global ATM brings all of your high-speed voice, data, conferencing, and imaging onto one worldwide network. Dynamically allocating bandwidth up to 155 Mbps.	
URL:	http://www.sprint.com

Tool:	V-SPAN
Company:	V-SPAN, Inc.
Description:	
Videoconferencing, Audioconferencing, Webconferencing etc. VideoSolution, IP Video Connect, Video Network Management Service, AudioSolutions, Streaming, WebSolutions, Event Management, Reporting, engageSuite.	
URL:	www.vspan.com

Tool:	WebEx
Company:	WebEx Communications Inc.
Description:	
Video Conferencing, web conferencing, teleconferencing and online meetings services.	
URL:	www.webex.com

Tool:	PlaceWare
Company:	PlaceWare, Inc.
Description:	
Real-Time Collaboration Solutions to Improve Business Productivity and Provide Cost Savings.	
URL:	www.placeware.com

Tool:	RainDance
Company:	Raindance Communications, Inc.
Description:	
Solutions for online meetings and presentations. Raindance specializes in online meetings and web events for marketing, sales and training professionals. Raindance's remote meeting and web seminar solutions enable user to remove the distance that separates herself from her goals. Our cutting-edge technology, consultative approach and outstanding customer support help user to increase the productivity and effectiveness of all her remote communications.	
URL:	http://www.raindance.com

Tool:	Centra
Company:	Centra Software
Description:	
Centra provides enterprise application software for real-time communication, collaboration and learning across the enterprise.	
URL:	www.centra.com

Tool:	Polycom
Company:	Polycom, Inc.
Description:	
Polycom, Inc is the leading provider of Unified Collaborative Communications - converged voice, video, web, and data solutions for emerging broadband networks. Our high quality virtual communications are easy to deploy, manage, and use and deliver an experience as natural as being there. All of which translates into increased collaboration and productivity, greater flexibility, faster decisions, lower costs, and improved relationships.	
URL:	http://www.polycom.com

Tool:	TANDBERG
Company:	TANDBERG
Description:	
TANDBERG, a leading global provider of video systems and services, helps companies and organizations fill the visual communication gap that exists today.	
URL:	http://www.tandberg.net

Tool:	VCON
Company:	VCON
Description:	
VCON is dedicated to bridging the distances between people, enabling them to work side-by-side, no matter how vast the distance between them. Using state-of-the-art videoconferencing technologies, VCON develops complete solutions that elevate communication throughout organizations.	
URL:	http://www.vcon.com

Tool:	Sony Conferencing
Company:	Sony Electronics Inc.
Description:	
Sony offers a wide range of audio and video conferencing solutions to satisfy the needs of professionals in diverse industries with varying technical and budgetary requirements. Sony Audio Conferencing Systems provide technology to facilitate single-language and multilingual meetings and events. Sony Videoconferencing offers a full line of systems that are perfect for the way you do business.	
URL:	http://www.sony.com

Tool:	eRoom
Company:	EMC Corporation
Description:	
Documentum eRoom is a flexible collaborative environment that enables people to work closely toward common goals, deliverables, and outcomes – both within the enterprise and beyond. This may include external entities such as partners, suppliers, customers, and clients. These distributed teams need a way to work closely, productively, and creatively. They need to plan, collaborate, strategize, and make decisions as they design and build new products, coordinate their supply and demand chains, engage clients, and work on other key business initiatives.	
URL:	http://www.documentum.com/eroom

Tool:	GroupSystems
Company:	GroupSupport.com
Description:	
GroupSystems is a comprehensive, robust, and open-structured set of tools to support a wide range of group processes in face-to-face meetings and on the Internet. The tools support various processes like strategic planning, activity based costing, business proces re-engineering and innovative problem-solving. The system is based on processes like brainstorming, list building, information gathering, voting, organizing, prioritizing and creating consensus of opinions. GroupSystems' many modules include Categorizer, Group Outliner, Topic Commenter, Vote, Survey and Alternative Analysis.	
URL:	http://www.groupsupport.com

Tool:	Microsoft Netmeeting
Company:	Microsoft Corporation
Description:	
NetMeeting provides powerful conferencing and collaboration functions in a complete, integrated package for the Internet or corporate intranet. The following standards-based capabilities are integrated into NetMeeting: *Multipoint Data Conferencing:* With NetMeeting's comprehensive suite of data conferencing tools, you can collaborate and share information with two or more meeting participants in real-time. You can share information from one or more applications on your computer, exchange graphics, send messages, or record meeting notes and action items with the text-based chat program, and send files to other meeting participants using the binary file transfer capability. *Internet Telephony/Audio and Video Conferencing:* With a sound card, microphone, and speakers, NetMeeting lets you talk to business associates over the Internet or corporate intranet in real-time. With a video capture card and video camera, you can send and receive video images over the Internet or corporate intranet for face-to-face communication during a meeting. You can receive video even if you do not have a camera connected to your computer. You can also use the video conferencing capability to take a snapshot with your video camera and place the image on the whiteboard for discussion or mark-up.	
URL:	http://www.microsoft.com/windows/NetMeeting/

2.1.4 Virtual Team Tools (DPM, virtual team and process-oriented tools)

Tool:	**Adobe LiveCycle**
Company:	Adobe Systems Incorporated
Description:	
Adobe LiveCycle delivers document services to integrate manual processes into enterprise applications. Organizations can address business-critical issues such as improving customer communications, increasing internal operational efficiencies, and helping them meet compliance mandates.	
URL:	http://www.adobe.com

Tool:	**Lotus Virtual Classroom**
Company:	IBM Corporation
Description:	
IBM Lotus Virtual Classroom provides organizations with a robust set of collaborative tools to create and deliver engaging web-based live learning sessions	
URL:	http://www.ibm.com

Tool:	**eProject**
Company:	eProject Inc.
Description:	
eProject Enterprise is a collaborative project management software designed for the Business User. Highly flexible and customizeable, eProject Enterprise is only as complex as you want it. It is easily adoptable by organizations with less experience in project management due to its low learning curve and intuitive simplicity, yet beneath the basic features, it offers powerful integration and customization capabilities demanded by advanced project-driven teams.	
URL:	http://www.eproject.com

Tool:	**OnProject**
Company:	onProject, Inc.
Description:	
onProject is an affordable web-based project management and group collaboration solution ideal for virtual teams, department level teams, project managers seeking a centralized online workspace for team members available from anywhere in the world at anytime.	
URL:	http://www.onproject.com

Tool:	Primavera IT Project Office
Company:	Primavera Systems, Inc.
Description:	
Project Management is an advanced critical-path-method scheduling tool providing project managers with the power necessary to create strategic project schedules.	
URL:	http://www.primavera.com

Tool:	Niku
Company:	Niku Corporation
Description:	
Clarity from Niku marries the strategic to the tactical. It couples top-down portfolio planning and analysis with bottom-up project, program, financial and process management. The result is a seamlessly integrated IT Management and Governance (IT-MG) system. Clarity gives executives a real time view into their organization's investments, initiatives and resources, and empowers managers to deliver controlled and predictable execution of projects and programs.	
URL:	http://www.niku.com

Tool:	Documentum eRoom
Company:	ECM Corporation
Description:	
eRoom provides a rapidly deployed and rapidly adopted Web-based collaborative workplace that enables distributed teams to work together to accelerate and improve development and delivery of products and services, optimize collaborative business processes, and improve innovation, problem-solving, and decision-making. eRoom is flexible and configurable, and can be adapted to support a wide range of business processes.	
URL:	http://www.documentum.com

Tool:	Lotus Virtual Classroom
Company:	IBM Corporation
Description:	
IBM Lotus Virtual Classroom provides organizations with a robust set of collaborative tools to create and deliver engaging web-based live learning sessions	
URL:	http://www.ibm.com

Tool:	Open Text
Company:	Open Text Corporation
Description:	

With its secure, central repository and comprehensive knowledge library functions, Livelink Enterprise Server provides industrial-strength functionality for organizing and managing structured and unstructured information. Livelink Enterprise Server stores and manages every type of object—from simple and compound documents to search queries and URLs—and provides pre-defined user access to these objects. It tracks and manages innumerable versions, attributes, document relationships, workflow maps as well as change histories—enabling your project teams to get their work done. You can search and check-in/out documents and other work objects. You can obtain a complete history or audit trail of objects, including a record of why changes were made. Storing and retrieving unstructured and structured information in a demanding environment can be a significant challenge. Livelink Enterprise Server is fully scalable and helps your organization develop innovative products and services to capitalize on changing markets conditions. Livelink for Document Management is a comprehensive document management product based on Livelink Enterprise Server that provides all of the key document management functionality.

URL:	http://www.opentext.com

Tool:	**Adobe LiveCycle**
Company:	Adobe Systems Incorporated

Description:

To fully realize the power of core applications, enterprises must extend the reach of these applications with processes that enable the secure capture of data. They also must be able to automate, manage, and track the processes that rely on that data.

By combining the business logic and data exchange capabilities of XML with the security and reliability of Adobe® Portable Document Format (PDF), Adobe Process Management makes it easy for organizations to integrate electronic documents with enterprise applications and business processes.

Adobe Process Management is part of the Adobe LiveCycle™ family of document services, which integrate manual processes into enterprise applications, helping organizations address business-critical issues such as improving customer communications, increasing internal operational efficiencies, and helping them meet compliance mandates.

URL:	http://www.adobe.com

Tool:	**Vitria**
Company:	Vitria Technology, Inc.

Description:

Vitria delivers Business Process Integration software solutions that automate strategic processes across a company's applications, data, people and trading partners. Hundreds of Global 2000 companies have successfully implemented Vitria BPI solutions to increase market share, improve customer experience, lower costs, and ensure regulatory compliance.

URL:	http://www.vitria.com

Tool:	FileNet Business Process Manager
Company:	FileNet Corporation
Description:	
FileNet Business Process Manager automates, streamlines and optimizes business processes by managing the flow of work between people and systems. Its ability to handle millions of transactions and thousands of users enables businesses to increase process performance, reduce cycle times, and improve productivity.	
URL:	http://www.filenet.com

Tool:	GroupSystems II
Company:	GroupSystems
Description:	
Internet-enabled solutions for business process management and online collaboration.	
URL:	http://www.groupsystems.com

Tool:	WinWin
Company:	Center for Software Engineering, University of Southern California
Description:	
The WinWin Spiral Model uses Theory W (win-win) to develop software and system requirements, and architectural solutions, as win conditions negotiated among a project's stakeholders (user, customer, developer, maintainer, interfacer, etc.). The WinWin negotiation tool is a Unix workstation-based groupware support system that allows stakeholders to enter win conditions, explore their interactions, and negotiate mutual agreements on the specifics of the new project being contracted. The model and support system also feature a central role for quantitative tradeoff analysis tools such as COCOMO (http://sunset.usc.edu/research/COCOMOII/index.html).	
URL:	http://sunset.usc.edu/research/WINWIN/winwinspiral.html

2.1.5 Collaborative CRM (customer resource management) (cCRM)

"The application of customer service representatives (CSRs) or other human agents to e-commerce, specifically pertaining to the sales and customer support processes" (Ward 2000).

Use of real time collaboration technologies (IM/chat, collaborative Web browsing, call backs, VoIP, streaming and two-way video and application viewing/sharing)

Tool:	FaceTime
Company:	FaceTime Communications, Inc.

Description:	
Only FaceTime offers 'Defense-in-Depth' – a comprehensive strategy for end-to-end security, compliance and management of IM & P2P.	
URL:	http://www.facetime.com

Tool:	**CosmoCall**
Company:	CosmoCom, Inc.
Description:	
CosmoCall Universe™ is a unified IP contact centre suite that includes multi-channel ACD, e-mail response, IVR, CTI, predictive dialling, multimedia recording and administrative tools.	
URL:	http://www.cosmocom.com

Tool:	**Talisma**
Company:	Talisma Corporation
Description:	
Talisma Multi-channel Customer Relationship Management (CRM) solution includes five of our powerful, best-in-class CRM software products; you deploy what you want, when you want. This means you can start with one or two products or deploy the full integrated suite of customer interaction modules as needed at no extra cost. Our products include: Talisma Knowledgebase — Talisma Knowledgebase is powerful knowledge base software that allows prospects, customers, partners, and employees to get fast, accurate, consistent answers to their specific questions via your Web site 24 hours a day. As a result, you can reduce reliance on more-expensive customer support methods such as Email or phone. Talisma Email Response — With ever-growing volumes of inbound Email correspondence, more and more Emails are mishandled, ignored, or do not receive quick replies. Talisma Email Response improves customer satisfaction by giving your agents the tools necessary to provide timely, relevant, and accurate responses. Talisma Chat — Want to improve communication with customers on your Web site? Talisma Chat software enables your customer service and support agents to communicate with visitors using real-time text dialogues and collaborative browsing (co-browsing) to facilitate one-to-one communication, online sales, and problem resolution. Talisma Campaign — Talisma Campaign automates service, marketing, and sales organizations by allowing them to send targeted Emails to segmented lists of prospects and customers in a planned, proactive manner. It also helps identify, track, and maintain pertinent information about how individual prospects, customers, and corporate accounts respond to those campaigns. Talisma Phone — Talisma Phone is help desk software that enables prospects and customers to contact a customer service agent directly by phone for timely, accurate, and relevant answers. With Talisma Phone, you can reduce operational costs, improve agent efficiency, and communicate with customers in a personalized and informed manner.	
URL:	http://www.talisma.com

Tool:	edocs Customer Self-Service
Company:	edocs Inc.
Description:	
edocs Customer Self-Service (CSS) solution enables organizations to empower their business and consumer customers to use self-service channels as their primary means to manage service and account-related activities, from finding information to executing transactions. An edocs Customer Self-Service site addresses customers most common inquiries, however, there may be times when customers who are engaged in online self-service require assistance to find the information they are looking for or to more completely resolve their issues. e-Service capabilities, including e-mail and chat, enable customers to pose their service questions electronically to receive the most appropriate automatic responses, or to have their issues routed to service agents for resolution. With edocs CSS Solution, organizations provide more valuable, convenient and effective service regardless of the channel their customers choose to access service. Whether through self-service (web and IVR), assisted-service (web and call center) and even print, organizations will be better able to completely fulfill their customers service needs, while also reducing costs and improving operations.	
URL:	http://www.edocs.com

Tool:	eGain Service
Company:	eGain Communications
Description:	
eGain helps organizations transform their traditional call centers into multichannel customer interaction hubs. eGain Service is the industry's most innovative and complete suite of customer service and contact center software.	
URL:	http://www.egain.com

Tool:	ServiceWare
Company:	ServiceWare Technologies, Inc.
Description:	
Knowledge management software and knowledge management solutions for the CRM call center and help desk.	
URL:	http://www.serviceware.com

Siebel Systems, PeopleSoft, J.D. Edwards, and other CRM vendors are just starting to incorporate collaborative functionality, and vendors like ePeople focus on the CRM process but provide collaboration and KM.

2.1.6 Portals and On-line Communities

Portals such as Plumtree (http://www.plumtree.com).

Online Community Tools:

Tool:	**Tomoye Simplify 4.0**
Company:	Tomoye Corporation
Description:	
Communities of Practice (CoP) are distributed groups of people who share a concern, set of problems, mandate or sense of purpose. As (often) informal groups of experts, Communities of Practice serve to reconnect individuals with each other in self-organizing, boundary-spanning communities. Communities of Practice complement existing structures by promoting collaboration, information exchange, and sharing of best practices across boundaries of time, distance, and organizational hierarchies. A great deal of knowledge creation happens in these less visible but increasingly recognized and supported groups. Communities of Practice are particularly useful in environments where domain knowledge develops dynamically and future knowledge requirements are not yet met. Organizations also formalize Communities of Practice when the knowledge in question is highly reusable, of high strategic value and/or the source of significant competitive advantage. The value of Communities of Practice: Communities of Practice provide their members with access to relevant, high-quality information from both inside and outside the community. They help maintain valuable business contacts and contribute to the generation of new ideas. They help solve daily problems and foster individual competencies, making a significant contribution to organizational learning. Community members also benefit from a shorter learning curve by being able to refer to the prior experience of other recognized experts. The transfer of best practices often leads to significant cost savings as experience gained in one organizational unit can be shared with other disconnected units that may encounter similar challenges.	
URL:	http://www.tomoye.com

2.1.7 Unified and wireless messaging infrastructures for collaboration

Tool:	**Presence-AR**
Company:	Advanced Reality, Inc.
Description:	
Presence-AR is the first real-time, peer-to-peer system and enablement platform for adding synchronous collaboration capabilities to existing and new software applications. Presence-AR uses a patent-pending data-centric architecture to provide a full range of collaborative features, and to eliminate the need to modify applications. Presence-AR is a collaboration platform with support for fail-over and persistence that allows a session to continue uninterrupted when a host signs-off, or is inadvertently disconnected. This enables participants to join and leave a session	

at will, and supports both synchronous and asynchronous collaboration. By providing collaboration on the data layer, Presence-AR:

- Allows users to collaborate on the same data using different applications
- Dynamically adapts views of the same data for the capabilities of any access device including PCs, handhelds, and mobile phones
- Enables collaboration across firewalls, LANs, and dial-up connections
- Provides secure collaboration through support of encryption, authentication, and access control systems

Presence-AR is a JAVA-based program that runs on the Java Virtual Machine. A C# version of Presence-AR is in development. Presence-AR includes a collaborative development platform that provides all the necessary infrastructure elements required to make an application collaborative. Presence-AR enables developers to add collaborative functionality easily and transparently to both existing and new software applications. With Presence-AR, developers can focus on building the core functionality of applications rather than struggling with the complexities of collaboration. Presence-AR manages:

- Network connections
- Data exchange synchronization
- Data interoperability with operating systems, applications, and directories
- Session and resource security including encryption, authentication, and access control
- Provisioning of collaborative resources
- Transparent fail-over in peer-to-peer or client / server configurations
- Scalability

Presence-AR is built around a data-centric collaborative framework. Integrating an application either existing or new into a data-centric collaborative framework, such as Presence-AR, requires the design and development of two components:

1. A collaborative representation of the type of data the application uses
2. A bidirectional adapter to translate events in the application into modifications to the data representation and vice versa

Once a collaborative representation of the data and the bidirectional adapters have been created, multiple participants can interact with a representation of the data and immediately have their changes represented to all other participants. Presence-AR handles the complexity of having multiple participants on multiple machines entering and leaving the environment at random times, as well as interacting with the resources at different times.

URL:	http://www.advancedreality.com

Tool:	**Octave Improv**
Company:	

Description:

Octave Improv allow users to create group lists that include phone numbers and instant messaging names from any of the major IM services including AOL Instant Messenger, MSN Messenger, Yahoo Messenger, and ICQ. Users then use the keypad or voice command to invoke a call to all members of the group. If a call is not completed, the system escalates to the next phone number.

The Octave Improv system will also send e-mails, pages, or SMS messages or search the IM services to see if the member is online and if he or she is, it will send an instant message requesting the team member's participation in the call.

Octave, based in Nashua, New Hampshire, is leveraging carrier technology that detects both presence and availability with its own hardware platform and applications to track users down.

URL:	http://www.octavecomm.com/

Tool:	SilkRoad TrueLook
Company:	SilkRoad technology
Description:	
SilkRoad TrueLook extends the value-chain relationship visually. SilkRoad TrueLook is an enterprise-class software system for deploying and managing networks of cameras on the Internet. TrueLook comes with a network of cameras, or works with an existing camera network and includes components for the acquisition, storage, management, branding, distribution, and sharing of image and video data. TrueLook is ideally suited for manufacturing, construction, retail and entertainment industries.	
URL:	http://www.truelook.com

Tool:	MS Exchange
Company:	Microsoft Corporation
Description:	
E-mail is currently the most widely used collaborative technology. More businesses use Exchange Server for e-mail-based collaboration than any other product. Exchange Server 2003 enables knowledge workers to gain access to critical business communications almost whenever and wherever they need to and is designed to deliver greater security, availability, and reliability.	
URL:	http://www.microsoft.com

Tool:	Groove Virtual Office
Company:	Groove Networks
Description:	
Groove Virtual Office: work together securely over the Internet as if you and your team are in the same physical location. Groove Virtual Office is everything your team needs to share information, manage projects, conduct meetings and get work done.	
URL:	http://www.groove.net

Tool:	NextPage 1.5
Company:	NextPage Corporation
Description:	
With NextPage, every department and team in your organization can manage and track document versions across e-mail, hard drives and servers. They can feel confident that they are always working on the most current, up-to-date versions of those documents. And they can find out exactly who is making changes, what kinds of changes they're making and what needs to happen next—all without adopting unfamiliar new habits or changing the way they work. NextPage 1.5 eliminates the time people waste working on the wrong document version. It brings control and order to the confusing ad-hoc processes people use to create and perfect documents. And it finally offers people complete freedom to manage and collaborate on	

documents in ways that make sense—whether they're on or offline—and whether or not other members of the team subscribe to the service. This puts a fast, permanent end to the chaos that takes place when twenty people try to edit twenty different versions of the same document at the same time—without any communication or coordination. With NextPage 1.5, you can finally give the documents that power your business the attention and care they deserve.	
URL:	www.nextpage.com

2.1.8 Other tools

In addition to previously mentioned tools, there are many others including Online Presentations (both interactive and streaming): one-to-one, one-to-many, many-to-many, e.g. PlaceWare, Webex tools, Real time presentations, meeting facilitation, Instant Messaging tools / Chat (MSN, Yahoo, AIM, ICQ, Jabber), and Directory Structures/Security: LDAP, Microsoft, Novell, Lotus.

3. TOOL SUPPORT FOR COLLABORATIVE DEVELOPMENT

This section will present software tools that enable collaborative software development in multi-organisational viewpoint. Project Management, Requirements Management, Product Data Management & Configuration Management and Testing tools are discussed. The characteristics and challenges for each tool category are described including the requirements for the tool support. The main object of this report is the Requirements Management tools but also examples of Project Management, Configuration Management and Testing tools are included.

Some of the tools support only particular software development process such as requirements engineering, -management and -tracing. There are also tools which could be used in the whole development chain. These are discussed in section 3.6 non-categorised tools.

Every tool category includes a list of tools that presents information collected from vendors' web-pages. As the total amount of tools is huge, rather an insight for available tools not a comprehensive list has been provided.

Tools included in this chapter are chosen based on the tool vendors promise to support collaboration; based on the information in their web-sites and white papers, potential support for the collaborative development was estimated. This way the functions and features that tools provide for collaboration can be found fast and thus more tools could be covered in the survey. Another approach could have been to set conditions and requirements to the appropriate tools first, and then analyze how they meet those requirements. This will be done in the SWOT analysis for selected set of tools.

In this phase, tools have not yet been evaluated in detail against the requirements.

3.1 STRUCTURE OF THE TOOL-TABLES

Tools are presented in tables. Each tool table includes five cells, their meaning is specified below.

Tool:	**Name of the tool.**
Company:	The manufacturer of the tool.
Description:	
In this cell there is a short description about how tool works and what features it includes.	
Installable / Web based:	Tool can be fully web based, when no installation is required to the client computer. On the other hand, tool can require installation also to the client computer. Price of the tool is also presented here, if it could be found from manufactures web site
URL:	Web address to the manufacturer's web site can be found here.

3.2 PROJECT MANAGEMENT TOOLS

3.2.1 Description and challenges for collaboration

Project management (PM) principles are rapidly changing. This is due to business globalization and information technology advances that support distributed and virtual project teams.

Traditional project management (PM) focuses on single project at a single location and is more interested in project inputs and outputs than in the project work itself. Scheduling, planning, and tracking are the main concerns in traditional project management. In the past 25 years, one of the major changes in PM has been the use of computerized tools and methods. (Romano et al., 2002)

As the number of distributed projects involving team members from different sites, organizations and cultures has increased, current and future PM will be more interested in tracking project work processes and efficient and effective sharing of information and knowledge among project contributors. (Chen et al., 2003)
Romano & al. (2002) suggest that in the future, the most significant change in PM may be the use of collaboration.

Business globalization and the development of IT have produced new organizational forms called “virtual organizations”. Both traditional and virtual organizations may employ “virtual projects” that involve team members from different geographical sites, organizations and cultures. Those are then called “virtual teams” (Peters 2004). The challenge of PM is supporting collaboration among these people. (Romano et al., 2002)

Öhrwall (2002) has found in her studies, that using an IT communication platform containing information that helps project management and daily operations such as notification of news, contact information, work process maps etc. could significantly improve the efficiency of the development process, mainly due to shorter lead times to find information. Long-term effects such as knowledge of individuals and organizations as a result of faster and more accurate information are also things to be taken into account.

Layzell et al. (2000) suggest that in distributed working there is a need to impose greater formality in the running of the team. Distributed workers have less opportunity to build up informal relationships with their co-workers on other sites. Furthermore, distributed work requires more discipline to keep track of documents and deliverables. Also, processes have to be well defined and understood which leads to more stable project environment.

In their studies Layzell et al. (2000) also found out that project members tend to be less committed to a project when a lot of the communication takes place by e-mail. On the other hand, some people are uncomfortable when using the telephone for technical discussions and problem resolution.

Chen & al. (2003) have identified several common themes they believe account the reason why many distributed projects either fail or are significantly less efficient and effective than they could be with increased collaborative and process support. The themes are as follows: Overemphasizing the project reporting aspect of PM, ineffective and inefficient communication, managing the project inputs and outputs but not process, reactive PM, and the lack of project repository.

Each of those problems can be addressed by using collaborative PM tools and processes. The goal is to get the right information to the right people at the right time. (Chen et al. 2003)

According to Romano et al. (2002), collaborative PM software can be classified into five levels, where the higher level software has all the capabilities of the lower level software. Levels are Communicative, Collective, Cooperative, Coordinative, and Concerted. It is the Concerted level of collaboration that will add true value to Project Management.

3.2.2 Requirements for PM tools in collaborative development

To be able to face the challenges described in the precious section, Project Management tools that support collaboration at it's best, should contain or be able to:

- central knowledge repository for file storage, tasks, timelines, and resource tracking.
- create, share, review and redline project documents, check calendars, coordinate schedules, and review tasks by project members.
- co-author a document in a parallel manner by project members.
- support both synchronous and asynchronous group problem solving and decision making (Romano et al. 2002)

In addition to these, tools should be compatible with each other and the usage should not require too heavy investments. (Öhrwall 2002)

3.2.3 Artemis Views

Tool:	**Artemis Views**
Company:	Artemis International Solutions Corporation
Description:	
Artemis Views is an enterprise project and resource management solution. Logically designed modules facilitate the creation of custom solutions that address the organization's specific project and resource management objectives. *Project Management* A collaborative project and resource management environment provides role based access to project data through a simple web browser. The solution brings together in a single environment all relevant project and resource data for display, modification, processing and reporting. This applies equally to structured data (dates, resources, costs, etc.) and unstructured data (documents, risk, e-mails, reminders, etc.) *Advanced Planning* Designed for project managers, project planners and resource managers, Advanced Planning combines multi-user project planning, resource allocation and scheduling, cost control and graphical reporting capabilities, thereby enabling more effective planning and scheduling of core resources: The Gantt-style barchart editor provides real-time project entry/edit (including copy and paste, drag and drop) capability with full critical path analysis and graphical reporting in single or multi-project mode.A resource search engine and interactive resource histograms allow assignment of project staff based on skills and/or availability.	

Advanced MSP Planning
With Advanced MSP Planning users can manage their projects and resources using a standard desktop environment through Microsoft(®) Project while benefiting from a centrally shared database and additional powerful features.

Time Reporting
Time Reporting is a Web-based or client server timesheet system designed to provide a comprehensive understanding of project and resource activity across ones enterprise. Time Reporting allows office-based users (via LAN or WAN) and remote users (via Internet or intranet) to access, edit, approve and update their timesheets from across the hall or around the world.

Earned Value Management
Earned Value Management is an application for project and program cost planning, control and earned value management reporting. Designed for program managers, financial managers, cost and control account managers, controllers and Integrated Product Teams. Earned Value Management provides complete project, contract and financial management, as well as, analysis and reporting.

Project Analytics
Comprises 2 independent modules; an **OLAP component** (GlobalView), and a **Datamart**. GlobalView™ is a fully-graphical application for navigating, analyzing and reporting on Artemis Views® project, cost, resource and schedule information. Designed for executives, project managers, financial managers and department managers, GlobalView delivers point-and-click access to all corporate projects via an intuitive browser, or Windows-based application. Individuals throughout the organization can consolidate multiple project data and easily drill-down through relevant data dimensions to make informed business decisions.

Installable / Web based:	Web based
URL:	http://www.aisc.com/

3.2.4 Active! Focus

Tool:	**Active! Focus**
Company:	Xapware Technologies
Description:	

Active! Focus is a workgroup solution for application life cycle management. Active! Focus integrates into teams regardless of their language, tool, or methodology preferences.

Active! Focus promises to present view of software projects throughout their lifecycles, maintaining a complete inventory of important project factors, such as project planning, project health analysis, requirements, change requests, defects, risks, issues and team discussions.

Active! Focus is able to administrate following tasks:

- Project planning. Support establishing a plan of events, identifying events, establishing a project outlook and charter, defining project general information and linking artefacts (requirements, defects, change requests…) to events for project tracking.
- Project tasks. Keep tracking of non-requirement related tasks at the project level, managing tasks, assigning tasks to people and specifying when the task is start and when it can be completed.
- Project health analysis. Viewing snapshot of a project health from a given point in the lifecycle, manipulating snapshot to display information that helps making decisions. It is also possible to print project health report for meetings and status reporting.
- Requirements. Complete requirements analysis for the project, individual team member

breakdown of specific requirement, requirement traceability, cross project requirement linking, collaborate using threaded discussion by clarifying requirements and explore alternatives. - Change requests. Controlling change management from inception through implementation, linking change requests directly to requirements, specifying change type and priority and assessing change impact. - Defects. Tracking and resolving defects for the project, capturing defect information, identifying defect severity and printing defect log for review meetings. - Risks. Assessment of project risks, identifying probability and impact of risks, linking risks to requirements and change requests and mitigating risks through action plans. - Issues. Managing and resolving key project issues, identifying situation and impact and also managing progress through issue logs. - Team discussions. Increases team collaboration and communication through project level discussions by identifying, communicating, and recording the important. A quick way to get feedback from across the team. Active! Focus is available as both a single user management tool, or as a complete workgroup solution.	
Installable / Web based:	Requires client installation. Price: Active! Focus single license $349 Active! Focus site license (25-user limit) $3299
URL:	http://www.xapware.com/

3.2.5 Enact Enterprise System

Tool:	**Enact Enterprise System**
Company:	Enact
Description:	
Enact is Internet-based solution for the collaborative enterprise. It provides an Internet-based framework and applications to establish real-time, enterprise-wide project collaboration. The Enact Enterprise System includes a scalable application server and three core client components: *ActionView* Collecting accurate data is only half the challenge, but presenting it in meaningful ways that support business decisions is also essential. ActionView gives executive management, project team members, customers and partners an up-to-the-minute overview of all the projects they're involved in: - Executives can view the project status and budget information - Team members have access to a complete repository of all project-related information - Customers and partners can have customized views of their own - ActionView acts as a central repository for all project-related information. Documents, spreadsheets, milestones and team member contact information can be published in real time to a company's Intranet. *ActionPlan* For project managers, ActionPlan is command central. It allows planning complex enterprise projects and it is able to do it in process and in real time. With ActionPlan it is able to - Create and oversee projects, tasks, schedules and users - Communicate up-to-the-minute project information - Identify potential schedule and resource risks - Manage resources and evaluate resource allocation across projects - Post documents, spreadsheets and other file types to projects, so that all project-related information is available in one location	

ActionPlan tries to help project managers to resolve issues and reduce performing administrative tasks.

ActionTask
With ActionTask, project contributors and team members collaborate interactively and in real time, anytime and anywhere. Project managers send team members specific task lists with due dates. As individuals complete an assignment and check it off in ActionTask, the updated status is reflected in real time on the project schedule. This ensures that every project participant always has access to the most current information and can:

- Quickly view and update task status from any web browser or PDA
- Manage tasks for one or all projects they're working on in one convenient place
- Setup personal work calendars and email reminders on tasks

ActionTask puts project managers and team members on the same electronic page.

Installable / Web based:	Can be deployed in several different ways: - Installed on the company Intranet for easy, secure access from any web browser - Accessed as a fully hosted application - Hosted by business portal sites as part of a comprehensive e-business solution
URL:	http://netmosphere.com/enact/enact.htm

3.2.6 Microsoft Project 2003

Tool:	**Microsoft Project 2003**
Company:	Mircosoft
Description:	

Project 2003 is a family of products designed to address the work and people management needs of today's organizations. Products in the Project 2003 family include Microsoft Office Project Standard 2003, Microsoft Office Project Professional 2003, Microsoft Office Project Server 2003, and Microsoft Office Project Web Access.

Project 2003 has two offerings designed for different needs.

- Project Standard 2003 is a desktop program for individual users.
- The Microsoft Office Enterprise Project Management (EPM) solution combines Project Server 2003, Project Professional 2003, and Project Web Access to form a business solution for organizations, departments and teams.

Project Standard 2003 is the latest version of the core Microsoft desktop project management program. It's a stand-alone program that helps enable project managers, business managers, and planners to manage and plan projects independently with familiar, easy-to-use tools. Project Standard 2003 is not designed to exchange data with Project Server 2003. To connect to Project Server 2003 from a desktop application, you need Project Professional 2003.

The EPM Solution brings together client, server, and Web-based technologies to enable organizations, departments, or teams to manage company-wide projects and align business initiatives for better results. Project Professional 2003, Project Server 2003, and Project Web Access are designed to work together to make up the EPM Solution.

- **Project Professional 2003** is the desktop enterprise project management program that is used with Project Server 2003 and Project Web Access to form the EPM Solution. Project Professional 2003 provides all the core project management tools found in Project Standard 2003, but also works with Project Server 2003 and Project Web Access to provide portfolio management and modeling, skill-based resource assignment, and project collaboration. Project managers can publish information from Project Professional 2003 to Project Server

2003 to share and track project plans centrally.

- **Project Server 2003** is the platform that supports the portfolio management, resource management, and collaboration capabilities in the EPM Solution. Project Server 2003 enables organizations to store project and resource information centrally and consistently. It also integrates with Microsoft Windows SharePoint Services for file management and collaboration capabilities, helping team members to work together more effectively. Users can connect to Project Server 2003 using Project Professional 2003 (desktop program) or Project Web Access (Web portal) to save, retrieve, and interact with Project Server data. Users can also use Microsoft Office Outlook 2003 to download their tasks from Project Server 2003 and view and report progress on their project tasks from Outlook.
- **Project Web Access** is the Web portal that enables connection to the project and resource information that is stored in Project Server and collaborates on projects. Team members, executives, and resource managers - in other words, anyone who needs access to Project Server 2003 information but does not require the scheduling capabilities of Project Professional - can use Project Web Access through a Web browser to view, update, and analyze information. Note that Project Web Access is not a separate product. Rather, it is enabled by Project Server 2003 and acts as the Web portal in the EPM Solution. You must have a Project Server 2003 Client Access License (CAL) to use Project Web Access.

Installable / Web based:	Requires client installation. Price: This information is for U.S. customers only Project Standard 2003 $599 Project Professional 2003 $999 Project Server 2003 $1499 For more information, see How to Buy: Project 2003.
URL:	http://www.msproject.com/

3.2.7 Projistics

Tool:	**Projistics**
Company:	Framework Technologies
Description:	

Projistics is project management software that helps companies in meeting their strategic goals through collaboration, knowledge management and business process support. It is a web-based collaboration and project management software for managing entire project lifecycles and logistics seamlessly, by facilitating collaboration in distributed teams. Projistics provides support for all Project Management activities like Project Planning and Scheduling, Task Management, Time Tracking, Issue Management, Defect Management and Resource Management. It also helps facilitate Change Management processes, thus minimizing defects and disruption caused by changing requirements or business objectives.

Features:

- Task Management. Project owners can baseline project plans for tracking schedules, manage project or task dependencies and milestones using task history and baseline reports. Tasks can be created and scheduled hierarchically and assigned to team members.
- Time Tracking. Integrated business activity monitoring is available through workflow approval processes for tasks and timesheets using the time tracking functionality of Projistics. Timesheets allow one to record and track actual resource utilization and effort spent on various tasks across projects, integrating with enterprise wide resource management features.
- Issue, Risk, Change and Defect Management. The issue tracking system in Projistics allows external stakeholders and team members to report and track issues. A defect tracking system allows reporting and tracking of product defects and bugs and helps in

project level Quality Assurance. The bug tracking application supports lifecycle management for defects, from logging and tracking of bugs till their final resolution. Projistics also allows team members to create a risk database for a project, identify the severity of a risk, analyze its impact, and discuss ways to mitigate the risk.

- Resource Management. Resource Management functionality in Projistics allows project managers to find the right resources to staff their projects, based on matching skills relative to project needs. Projistics also allow for the control of scheduling and commitment of resources using report and alerts; and help resolve resource conflicts.
- Collaboration and workflow. Projistics allows organizations to define their own business and communication processes. A role based workflow engine allows team members to collaborate as they would in real life. An integrated Discussion Board module helps in managing threaded discussions related to project issues, facilitating information management in distributed environment and archiving project related emails. Projistics offers a web-based interface, collaboration features and configurable rules for notifications and automatic escalations, to facilitate collaboration during the project lifecycle.
- Knowledge Management. Projistics enables business and technology intelligence gained during one project to be shared for use in subsequent projects to reduce cost and overall risk. The Knowledge Management module allows for sharing of enterprise wide best practices. The Document Management system with its check-in / check-out functionality, version control and approval routing, enables sharing and collaboration of live documents among teams.
- Project Implementation. Projistics helps organizations in the deployment and institutionalization of quality models such as the SW-CMM / ISO process framework. Policies, procedures, guidelines, templates, and project data can be kept in a centralized repository for use by distributed teams.
- Executive Reporting. Projistics allows organizations to define, evaluate, and monitor their portfolio of projects through combination of customizable reports and dashboards that provide real time performance to all stakeholders. The reporting features enable users to analyze project status, individual tasks, resource utilization, issues, risks, and other project related items to help improve efficiency and profitability of the organization.
- Portfolio and Opportunity Management. Using Projistics, managers and executives are able to track the health of their project portfolio at any given time for optimizing portfolio performance.

Being web-based collaboration software, Projistics provides access to teams distributed in space and across time zones. Projistics allows an organization to define its own business and communication processes. Discussion Board functionality helps in managing threaded discussions related to project issues, facilitating information management in distributed environment. Configurable rules for notifications and automatic escalation helps the team to collaborate during the project lifecycle. Projistics Desktop Assistant, a client application, helps in instant messaging across teams; receiving alerts and managing repeatable tasks.

Installable / Web based:	Seat-based licensed software requires installation to the company's web server. Made available to all the users through HTTP web server by using web browser. Price: The number of licences is based on the number of named users. For more information: sales@projistics.com .
URL:	http://www.projistics.com/

3.3 REQUIREMENTS MANAGEMENT TOOLS

3.3.1 Description and challenges for collaboration

In this document, requirements management (RM) is seen as a parallel support process for other requirements engineering methods. Also change management is part of requirements management, as requirements have a tendency to change during system development and these changes must be managed. According to Sommerville and Sawyer (1997) (see Parviainen et al. 2003), the principles concerning requirements management are:

- Changes to the agreed requirements need to be managed.
- Relationships between requirements should be described and managed.
- Relations between requirements documents and other documents produced during the systems and software engineering need to be managed.

They also propose that RM can be organized under four main RM activities as follows:

- Requirements identification: all guidelines, which relate to the identification and storage of requirement items.
- Requirement traceability: all guidelines which relate to the requirements traceability.
- Requirements change management: all guidelines, which relate to the requirements change management.
- Requirements management planning: guidelines, which relate to the planning and documentation of identification, traceability and change management activities as well as the definition of other RM goals, responsibilities and policies for a project. Planning provides means to select and define suitable RM procedures when considering RM for a project.

Kotonya & Sommerville (1998) (see Parviainen et al. 2003) have stated that as there is usually a large amount of data and unstable requirements collected during RE process, RM tools have been developed to help in managing them. RM tools support the management of requirements database and changes to these requirements. They collect together the system requirements in a database or repository and provide a range of facilities to access the information about the requirements.

Many RM tools are based on database. They may have relatively few records but each of them may include many links i.e. to documents, text files or other requirements. Commonly used database types are relational database systems and object-oriented database systems.

Currently many of the RM tools are based on relational databases, but according to Sommerville and Sawyer (1997) (see Parviainen et al. 2003), object-oriented databases are structurally more suited to requirements management. Different types of information can be maintained in different objects and the way the links between objects is managed, is quite straightforward.

Paasivaara and Lassenius (2003) state that inter-organizational software projects are often faced with uncertainty regarding requirements and implementation techniques. This is due to the need to involve subcontractors or partners long before these things are resolved. Parties cannot receive clear requirements specification at the beginning of the project. In such cases, close cooperation and communication between parties is required during the

whole project life cycle, as the project both builds a product and at the same time tries to understand what to build.

“Requirements engineering and information management has been a vital part of the engineering development process for many years, and is a key determinant in delivering a compliant product on time and within budget. The demands on today's engineering teams grow; with ever more complex & sophisticated systems, continual change, with geographically disperse teams and continuing pressure on cost and time. To meet these challenges new information management tools are needed.” (http://www.viewset.com)

3.3.2 Requirements for RM tools in collaborative development

Parviainen et al. (2003) summarise requirements for RM tools that were collected from literature. According to them, software requirements tool must be able to:

- Maintain unique identifiable description of all requirements
- Classify requirements into logical user-defined groups.
- Specify requirements with textual, graphical, and model based description.
- Define traceable associations between requirements.
- Verify the assignments of user requirements to technical design specifications.
- Maintain an audit trail of changes, archive baseline versions, and engage a mechanism to authenticate and approve change requests.
- Support secure, concurrent co-operative work between members of a multidisciplinary development team.
- Support standard system modelling techniques and notations.
- Maintain a comprehensive data dictionary of all project components and requirements in a shared repository.
- Generate predefined and ad hoc reports.
- Generate documents that comply with standard industrial templates.
- Connect seamlessly with other tools and systems.

The same requirements apply also in collaborative development. The additional challenge to requirements management tools in collaboration compared to traditional projects is the fact that the tools should also work over company borders.

3.3.3 CaliberRM

Tool:	**CaliberRM**
Company:	Borland
Description:	
CaliberRM is collaborative, Web-based requirements management system that facilitates communication among project teams by providing centralized requirement data to distributed team members and allowing documented discussions about requirements as well as allowing project teams to fully define, manages and communicate changing application or system requirements. Changes made to requirement data such as traceability, document references, status, user responsibility and more are recorded in CaliberRM's central repository. CaliberRM keeps team members up to date on changes made to requirements by automatically notifying responsible individuals of the changes. CaliberRM also enables team members to quickly identify potential requirement problems by highlighting ambiguous and commonly used terms defined in a shared glossary.	

CaliberRM allows project teams to provide input on requirements via standard browsers and remote clients can access the system through an Internet connection. Using CaliberRM to define, prioritize, and track requirements, software development teams can respond rapidly to ever-changing requirements.

Installable / Web based:	Requires installation.
URL:	http://www.borland.com/caliber/

3.3.4 CARE 3.2

Tool:	**CARE 3.2**
Company:	Sophist group
Description:	
CARE - Computer Aided Requirements Engineering - is a Lotus Notes based tool which helps Requirement Engineering and Management process. It supports developers with technical and non-technical systems and software products. It helps developers with the requirements process of a new system or a new software product with collecting, optimizing and traceably managing requirements through all iterations. CARE was built because of challenges and hurdles incurred while working with software engineering projects. For example one goal was to reduce the classical loss of information, the usual misunderstandings and misinterpretations between what is demanded of the new system and what is actually implemented. CARE also ensures that all changes and decisions during development are traceable and helps the entire project team to develop presentable requirements to a new system. CARE has following functionality which helps to handle requirements elicitation and management process. - Possibility to import documents - Encoded communication - Digital signatures - Full-text search through all documents - Worldwide spread mobile working - Interface to UML CASE tools and MS tools - Replicable groupware that helps teams working spread worldwide - Versioning of documents - Semantic analysis of requirements - etc. All involved team members are able to work on requirements with their various roles and rights where ever they are by using local “database copies”. By replication with the CARE database on the server, the requirements are being updated to the current standing. Because of diverse contents which are getting put onto the database during replication the so called "replication-conflicts" show you when requirements have to be reconciled.	
Installable / Web based:	When using CARE Web via browser, the functionalities are somewhat limited. To gain full functionality, installation is required; also Lotus Notes software package meant to be installed.
URL:	http://www.sophist.de/sopgroupeng.nsf/(ynDK_framesets)/Main Price: 150€ per user.

3.3.5 Catalytze Suite

Tool:	Catalytze Suite, Catalytze Enterprise
Company:	SteelTrace
Description:	
The Catalyze Suite of products provides a practical approach for organisations to capture, document and model Business and System Requirements. Compared traditional Requirements Management tools, Catalyze take a more structured view of requirements breaking them into functional and non-functional requirements. Catalyze automatically generates graphical flows directly form text and maintains text and graphics in lockstep. One of the key themes of Catalyze is that structured requirements yield tightly traceable structured outputs for different audiences. For example, this means that a Catalyze project once defined by non-technical stakeholders can now automatically generate MS Word business and test documentation, HTML gap reports, MS Project plans with tasks & activities and UML Use Case & Activity diagrams. This ensures real traceability from Business to Technical groups. **Catalyze Enterprise** is designed for teams who are collaborating on requirements capture and modelling by updating and sharing a project. Catalyze Enterprise supports multiple loading of repository projects, a powerful concurrency mechanism, the ability to go 'offline' and the ability for users to reconcile offline changes back into the master project. Catalyze Enterprise also lets multiple users simultaneously work on a project or project package. It uses a client-server approach and stores projects in an industry standard SQL database. It allows searching across all database projects (including unloaded projects) meaning that information sharing becomes reality in the enterprise.	
Installable / Web based:	Requires installation.
URL:	http://www.steeltrace.com/products_catalyze_suite.htm

3.3.6 EasyRM Requirement Management Suite

Tool:	EasyRM Requirement Management Suite
Company:	EasyRM
Description:	
The EasyRM is Requirement Management software, which tries to make requirement management and administration easier. The EasyRM is a component-based tool targeting initial stages of project life cycle. It supports particularly establishing project framework, requirements gathering and requirements synchronization. The main feature is offering clear presentation and understanding of project requirements. The EasyRM is a component-based product. The central idea of the EasyRM Suite is that each component should do only one thing, but do it as well as possible. Individual EasyRM components, therefore, act like a constructor, from which a suitable EasyRM configuration can be assembled for any specific user needs. Component-based architecture offers some advantages, such as: - Feasibility of use. The component-based architecture of EasyRM allows you to purchase only those components which you really need to do a specific work. - Ease of extensibility. The component-based architecture of EasyRM has been carefully designed to make future extensions (i.e. writing additional components) as easy as possible. - Reliability. The separation of an entire EasyRM Suite into small, manageable components	

has allowed performing an extensive testing of these components, thus improving the product reliability.

EasyRM offers among others following features:

- EasyRM is suitable for managing domain- or project-specific dictionaries for projects in industrial, commercial, educational and research-oriented domain.
- Terms defining for ones project using EasyRM Glossary.
- Creating and editing project source documents library using EasyRM Document Manager.
- Editing requirement descriptions, their classification and define relationships between requirements and the other parts of the requirement model, that is project glossary terms and project source documents using Easy RM Requirement Manager
- Checking requirement models consistency with Easy RM Consistency Mentor.
- Generating reports on the specified part of the current database and exporting it in the specified format with Easy RM Report Generators.
- EasyRM has also other features, which try to help complete software projects.

Installable / Web based:	Requires installation. Price: EasyRM Glossary Expert Profile $150 EasyRM Requirement Analyst Profile $290 EasyRM Complete $510
URL:	http://www.easy-rm.com/easyrm.php3

3.3.7 PACE

Tool:	**PACE**
Company:	ViewSet
Description:	

PACE is an enterprise solution to capture, analyze, develop, link and manage information throughout the product lifecycle. This enables developers to meet their goals and deliver to the expectations of their customers. PACE is a requirements & information engineering and information management tool supporting multi-site and multi-user access. It allow organizations to access and work with their critical project information from anywhere in the world. PACE provides a security model and the infrastructure to give the user an easy to use, secure solution that can be used across the organization.

PACE is not only document management system but it extends the ability of a team or company to work on various sections of the same or different documents simultaneously. PACE granularity occurs at the object-level, allowing a virtually unlimited number of engineers, testers, managers and even customers to access the same data set simultaneously.

The PACE Security Model requires that user accounts are created to authenticate users as they log on. Each user is then assigned to a role to control what information they can access and actions they can take (read, write, edit etc) for each information category. In this way each group, for example QA, can be given appropriate access.

PACE has a powerful information modeling tool that allows the user to incorporate process rules into their requirements management, and define a variety of different categories of information and the relationships between them. This model gives the project leaders and managers flexibility on how they manage and track their critical information; for example different types of requirements (System, Software, Hardware, Interface Definitions, Security Guidelines). Each information category is defined as a folder with defined attributes (dates, risk, priority, cost etc), which can be set as mandatory or optional, each folder can be broken down into a hierarchy of sub-folders.

PACE uses the Information Model to control what relationships can be created by the user. When the user selects the option to create traceability links, PACE only presents the defined

relationships; for example requirements to design objects or validation tests. In this way lifecycle traceability reports can be created showing how a requirement has been developed, the implementation and the verification & validation tests that have been run. Changing a piece of data, whether it's a requirement or a test procedure, has the potential to impact other pieces of data, which may in turn need to be changed to account for the original modification. PACE supports traceability to help in managing this complexity efficiently and effectively. PACE can communicate with other tool environments using a number of mechanisms and formats, including SQL, SOAP, Java, EJB, Servlets, .NET, XML, etc.

Installable / Web based:	PACE is web based solution, no client software to install.
URL:	http://www.viewset.com/

3.3.8 Prosareq

Tool:	**Prosareq**
Company:	Insoft Oy
Description:	
Prosareq offers solutions, which is required in requirements management according to the modern software engineering research. Prosareq offers browser-based user interface, which makes possible that in addition to developers also customers, marketing, quality persons and management may actively participate in requirements collection and analysing. Prosareq visualizes requirements in a consistent web-document, which is synchronized with development process. Prosareq makes possible e.g. that a salesman abroad may check through web if certain customer requirement has been realized in the current product version or if it will be realized in the next version. Prosareq is a multi-project, multi-user database tool and it supports in a natural way team member roles and rights like viewer, updater, reviewer, approver and administrator. The requirements are classified according to criteria like user interface, performance, technology, etc. You may assign person responsibilities like creator, implementer, reviewer and approver for every requirement. Also other attributes like version, status, stability, reason, importance, difficulty and costs may be attached to every requirement. Prosareq produces high quality documents and reports from the requirements database. Requirement attributes may be included in reports. You may produce selective reports, e.g. a report presenting those requirements, which are implemented by a certain designer. The requirements have living hyperlink connection with other design documents like Prosa UML models, source codes and other documents. Requirements tracing gives an answer to question: “Where certain requirement is realized?” Requirements tracing gives valuable information about those changes, which must be done in UML models and other design documents if a requirement is updated. Prosareq offers automatic versioning of the requirements, which makes possible to study the complete path from the original requirement to current version.	
Installable / Web based:	Web based solution, no installation needed.
URL:	http://www.prosa.fi/eng/pr2Req.htm

3.3.9 Rational RequisitePro

Tool:	Rational RequisitePro
Company:	Rational Software
Description:	
Rational RequisitePro is a requirements management tool designed for multi-user environments. It features integration of Microsoft Word and a requirements database. Software project teams can gather, enter and manage requirements within ones documents or in a database. Automated traceability tracks requirements and changes through implementation and testing. Related requirements can be linked together, so that as changes occur to one requirement users can easily see its impact on other related requirements. RequisitePro includes templates to simplify production of requirements documents. It supports a choice of databases (Oracle, Microsoft SQL Server, and Microsoft Access), which allow users to organize, prioritise, and trace relationships between requirements. RequisitePro includes the ability to treat linked files as a requirement and trace other requirements to your linked files. If using the dynamic Word integration, review and markup are supported via MS Word's revision and security features. Offline authoring of requirement documents allow team members to take a document offline, work in a separate workspace and then bring back the document online to be merged with the previous version. For those not using the dynamic Word integration, static Word documents can be generated for review purposes. There is also support for email-enabled discussion groups to capture any dialog about new requirements, modifications of requirements, or any requirement-related topics. Collaboration between companies is not individually supported, but normal team-based requirements management is possible by delivering and managing requirements using requirements database and document delivery.	
Installable / Web based:	Web based, no installation required.
URL:	http://www.rational.com/ http://www.rational.com/products/reqpro/index.jsp

3.3.10 RDT

Tool:	RDT
Company:	Igatech Systems
Description:	
RDT has been developed to capture the design process and manage the system requirements. It is designed to keep track of the requirements used to produce a system. RDT tries to ensure the requirements are met by capturing the test information against which the requirements will be tested. With help of RDT it is easier to formulate specifications and requirements, trace and manage requirements through the development cycle and develop test procedures and allocate these to requirements. RDT is developed and optimised for use with Microsoft office tools. Features: - Automated requirements capture and syntax parsing directly from existing documents - Traceability between parent and child requirements capturing associated design decisions - Requirement verification through test criteria assignments - Document style editing of data including drag and drop document outline - Automated document production directly into MS Word, including requirement and test	

specifications, Requirement Allocation Matrices, parent-child relationships and design documents - Multiple concurrent window views - Revision tracking and baseline allocation, including proposals for change - Workgroup access privileges to control user access down to individual records - Check-In / Check-Out for sharing data across multiple sites - Network accessible for multi-user database access - up to 255 concurrent users - Extensive on-line context sensitive help - Microsoft Windows based application compatible with MS Office

Installable / Web based:	Requires client installation. Price: Software: $2,995 per user. Support : $650 per user
URL:	http://www.igatech.com/rdt/

3.3.11 Release Planner

Tool:	**Release Planner**
Company:	Release Planner
Description:	
Decision-making plays a vital role in any Information Technology enterprise. In order to achieve the best return from company's investment, decisions have to be based on best knowledge and sound methodology. Release Planner is a web-based system solution to enable planning, priority and road-mapping decisions. It has created with a view to improving these functions specifically as they apply to the Information Technology sector. Release Planner can be integrated into existing environment. Release Planner adds intelligence to existing processes. Main features of the tool suite are: - Comprehensive scenario capabilities to better understand problem variables, constraints, bottlenecks and objectives in order to provide qualified decisions. - Consideration of different resource types (i.e. supply, human resources, space) and/or budget constraints as well as regulatory considerations. - Allows grouping of objects with individualized stakeholders' access rights. - Web-based usage scenario allowing access of remote stakeholders. - Balancing of weighted stakeholder priorities. - Generation of alternative release plans being in a 95% optimality range, with respect to a weighted objective composed of value, satisfaction, dissatisfaction and risk. - Generation of a set of most diversified solution alternatives out of the set of qualified 95% solution; - Comprehensive facilities for re-planning and 'what-if' scenarios. - Customizable reporting capabilities to facilitate human involvement. - Flexible import and export capabilities allow easy integration into existing information.	
Installable / Web based:	Web based
URL:	http://www.releaseplanner.com/

3.3.12 RMTrak

Tool:	RMTrak
Company:	RBC Product Development

Description:

RMTrak is a collaborative requirements management software tool designed for managing each project's complex requirements. It is a software tool that captures, tracks, and manages the project requirements you keep in your requirements documents - without interfering with your document creation process. RMTrak lets you use the tools you're already familiar with to format and edit your documents, including Microsoft Word with its word processing features.

Document management is implemented so that one user at a time is allowed to update a document that contains the requirements. Each user can open a copy of a document locally and make changes to it. When the global version of the document becomes available for writing they can integrate their changes. RMTrak supports the revision marking features included with MS Word.

When requirement document is created, it is able to tag every requirement by using RMTrak and then add them in the requirement database. Once a requirement's attributes show it has passed all of its tests, RMTrak will mark the item as "closed." That way, you can generate reports based on which items successfully passed their tests and which requirements have been fulfilled for the project.

Features:

- Integration with Microsoft Word.
- Document-centric approach reduces time for typing requirement into the applications database.
- Possibility to import data from other Requirement Management tools.
- Can be installed on a server for use by multiple individuals.
- Data capturing, establishing requirements management process to capture, organize and manage entire projects.
- Attributes assignment. It is able to organize and trace requirements details, establish information relationship between multiple documents, assign attributes to the information such as task assignment, priority and status, and change these over time to reflect changes in project.
- Change Management, Traceability. RMTrak lets you stay in control of schedules, resources and deliverables. It can manage the impact that changes have on your project objectives and helps team members to understand their responsibilities and the impacts of changing requirements on their project.
- Reporting. RMTrak keeps track of requirements and avoids unnecessary and costly revisions. RMTrak lets you locate specific information using keyword searches. It is able to use any of the default reports, including Orphan, Childless, Unallocated, Suspect, Closure and Requirements Summary, and Change reports, or has RBC Product Development develop a custom report format that suits your organization. Also using hyperlinks to navigating between reports and requirements documents is possible.
- With RMTrak's tag filter, listing requirements of different projects within the same document is possible. Tag filter allows each project to only recognize document tags that were intended for it, ignoring any tags intended for another project. This lets you use a requirements management document for more than one project.
- Easy database recreation. If database is corrupted for some reason, it is able to recreate it by creating new project by RMTrak and then re-import the project's documents.
- SQL Database Queries. RMTrak lets you generate views using SQL queries, in addition to its other views, so you can retrieve and view any desired information from the project's database.
- Flexibility. You can create any type of document, with any format, any structure, and any

purpose, and RMTrak can still track the requirements listed in the document. To RMTrak, it doesn't matter if the requirements are presented in tables, bulleted lists, or just mentioned somewhere in a paragraph.

RMTrak doesn't appear to offer particular support for collaboration between companies, but normal team-based requirements management is possible by delivering and managing requirements using requirements database and document delivery.

Installable / Web based:	Requires client installation. Price: Users 1-4, Price $250/user Users 5-9, Price $215/user Users 10-50, Price $196/user Site licence, Price $9995
URL:	http://www.rmtrak.com/

3.3.13 Serena RTM

Tool:	**Serena RTM**
Company:	Serena

Description:

Requirements & Traceability Management (RTM) is the solution for tracking and managing requirements throughout a project lifecycle. With Serena RTM, developers can quickly get the information they need to ensure that their projects succeed.

Users can capture legacy requirements from existing Word documents into the RTM environment, or use Word to author new requirements. RTM allows users to then associate additional information, called attributes, with individual requirements. These attributes might include cost, schedule and other types of metrics data. The requirements, along with their attributes, are automatically captured and stored in its Oracle data repository.

Once requirements have been captured into RTM, any stakeholder who has appropriate access rights can view the requirements through their favorite web browser. Users can comment on requirements in the context of a discussion thread, and even use the web interface to submit change requests against requirements. This information is automatically stored in RTM so that the rationale behind decisions is preserved.

Serena RTM allows users to personalize the way in which data is presented to them by a customizable forms interface.

Certain query facilities allow users to filter out unwanted data and zero in on information that is of interest to them. Complex queries can be built via point-and-click interface, and then saved for later use. Using these query facilities, users can then create customized reports without the use of complicated scripting languages. These reports can then be saved and made available to applicable stakeholders via print or Web access. This makes it possible for different users to get the information they need, when they need it.

RTM allows users to organize information into classes, or categories, and then link those classes together to define logical relationships. Any object, or instance of a class, can be related to any other object, or instance, as long as a valid relationship exists between the two respective classes. The instance of the relationship is called a link.

Being able to track requirements changes, and the reasoning behind the change, is critical for effective requirements management. Serena RTM allows users to manage changes efficiently. RTM automatically versions every piece of information so users can view an object's history at any time, discovering who created or modified the object, why it was changed, and even see the differences from previous versions.

Installable / Web based:	Web based.
URL:	http://www.serena.com/Products/

3.3.14 SpeeDEV RM

Tool:	**SpeeDEV RM**
Company:	SpeeDEV
Description:	
SpeeDEV RM is a collaborative, requirements capture, management and analysis application. It conveys the appropriate goals and deliverables of a project to diverse team members (customers, analysts, software architects and designers) so they can together work on constantly changing needs and immediately clarify who needs to resolve issues and when. SpeeDEV RM's implementation of requirements capture, traceability, incremental baseline, intelligent reporting and process driven approach allows teams to effectively manage an evolving set of requirements and map them to system features. SpeeDEV's encompasses technologies that are necessary for engineering management success. The independent point solutions for Requirements Management, Issue and Defect Tracking, Test Case and Test Plan Management, Project and Task Management, and Process Automation are combined into a modular solution, that can expand as needed and integrate with other technologies. SpeeDEV is a web-based environment for all participants in a software project to cooperate, manage Requirements, Bugs, Defects, non-Technical problems, assign tasks, enter timesheets and define, implement, deploy and enforce processes from start to finish. It also enables organizations to collaborate through context based threaded discussions, automatic event notification and document management. SpeeDEV includes the following components: - Requirements Management (RM) - Issue Management (IM) - Process Management - Task Management - Project Planning - Time Management SpeeDEV is a Distributed Software Life-Cycle Process Management System.	
Installable / Web based:	SpeeDEV client is browser based, but it has to be installed to the company's web server. Pricing is based on the number of users. Contact the SpeeDEV sales team (sales@speedev.com) for a price quote for your requirements.
URL:	http://www.speedev.com/requirements-management.htm

3.3.15 Telelogic DOORS

Tool:	**Telelogic DOORS**
Company:	Telelogic
Description:	
Telelogic DOORS is requirements management tool with a multi-platform, enterprise-wide system designed to capture, link, trace, analyze and manage changes to information to ensure a project's compliance to specified requirements and standards. DOORS user interface makes access easy for numbers of concurrent users on a network, and it can maintain numbers of objects	

(requirements and associated information) and links.

DOORS includes an Enterprise Change Proposal System that lets users submit proposed changes to requirements on-line, including a written justification. Inter-project linking allows projects to share requirements, designs and tests, and promotes traceability to corporate or other standards. Discussion threads allow subject-oriented collaboration on ideas which increases creativity, and delivers faster ideas, turnaround and results. And Distributed Data Management (DDM) supports remote users who need temporary, remote access to all DOORS features. Working against a subset of the DOORS database off-line, remote users can incorporate their updates back into the master database - making it easy to team with other organizations to communicate with subcontractors and suppliers.

DOORS provides user-defined, multi-level traceability for relationships like requirements to test, requirements to design, design to code, requirements to tasks, and project plan to roles. DOORS' Traceability Wizard can generate link reports across as many levels as required and display them all in the same view providing fool-proof lifecycle verification and validation.

Dynamic Requirements Management is made possible in DOORS with capabilities such as Intelligent Traceability, Proactive Suspect Links and a Requirements Change Proposal Process that provide the highest levels of requirements visibility, collaboration and validation.

Intelligent Traceability ensures that all teams are using the right requirements for the increment or version they are working on.

Proactive Suspect Links ensures that each team member knows about changes made by another, automatically. DOORS proactively generates change notification directly in the requirements documents so that nothing is overlooked.

Requirements Change Proposal Process provides a role-based view of the requirements component of the overall change process, managed by Telelogic's change management solution SYNERGY Change. This configurable change process enables users to submit, review and approve requirements changes within the requirements document. This simplifies collaboration between team members and ensures the impact of each change is understood before it is made.

Installable / Web based:	Requires installation.
URL:	http://www2.telelogic.com/products/doorsers/doors/

3.3.16 XTie - RT

Tool:	**XTie – RT**
Company:	Teledyne brown engineering
Description:	

XTie-RT Requirements Tracer (Cross Tie) is a client-server, PC based application designed for use by anyone who needs to manage requirements. It is affordable and easy to use while remaining full featured.

XTie-RT is sold as a multi-user or a stand-alone application. Both applications are multi-project capable. It supports all aspects of systems engineering and project management. This includes requirements analysis, functional analysis, project management, proposal evaluation, trade study documentation, risk analysis, and testing.

XTie-RT supports multi-user environment, it is capable of up to 128 simultaneous users operating on multiple projects.

XTie-RT supports following tasks: - Proposal Management - Requirements capture - Requirements organization - Requirements traceability - Quality assurance - Risk analysis - Requirement validation	
Installable / Web based:	Installation required. Price: XTie Windows Server Software $1499 XTie Windows Client Software $650 XTie Solo Windows Single-user Software $1299
URL:	http://www.tbe.com/products/xtie/

3.4 PRODUCT DATA MANAGEMENT AND CONFIGURATION MANAGEMENT TOOLS

3.4.1 Description and challenges for collaboration

Product Data Management (PDM) tools focus to the product information management aspects of system design phase and HW design phase while the support for SW development has been left in minor attendance. PDM systems primarily manage mechanical and electronics product data, and software has a product information management discipline of its own called Software Configuration Management (SCM) (Estublier 2000).

There are hundreds of SCM tools available containing features depending on their backgrounds and purposes. For example, simple version management tools, CM tools, etc. Currently, software CM systems provide the following services (Estublier 2000):

- Repository for components: provides ability for storing and distributing product-related information.
- Support for SW engineering activities.
- Process control and support.

The “product data management” is not a new activity. It has been practised already when documents and drawings have been produced and archived on paper. First computer aided solutions for PDM became available in the late 80’s. They have evolved mainly from data management modules used in MCAD (Mechanical Computer Aided Design) systems (Miller et al. 1997)(Crnkovic et al. 2003). Also needs in manufacturing have influenced on PDM systems (product structures) (Crnkovic et al. 2003).

Nowadays the division between Document Management (DM) tools and PDM tools is difficult because the functionality overlaps. The both aim to provide support for storing, retrieving and distributing company’s documentation. However, PDM focuses stronger to product structure management. The functionality of commercial Product Data Management -systems varies. Miller et al. (1997) define PDM functions as follows:

- Data Vault and Document Management (DVDM): provides the basic repository for data, links, and meta-data. It also provides control, access, security, and version management functions. Jansson et al. (2001) state that electronic document management should cope with the following challenges:
  - the amount of documents, versions, change management, different formats
  - archiving
  - electronic acceptance and signatures (documents that need acceptance, e.g. agreements, contracts,…)
  - confidentiality (this is especially important in collaborative development environment where one partner can belong into several collaborative networks)
- Workflow and Process Management (WPM): provides the possibility to support company’s processes.

- Product Structure Management (PSM): provides the possibilities to create and modify product structures and configurations. It also connects PDM managed items (such as drawings and documents) to the product structure.

- Classification and Retrieval: provides a tool for retrieval of existing information (documents, parts, and standard components), as well as classification of information and reuse support.

- Program Management: project management, containing extensive features like resource and expenditure management.

- Communication and Notification: provides communication and notification facilities for PDM.

- Data Transport: data transport functions between systems, users, and PDM functions.

- Data translation: tools for data translation functions (files being moved between two applications must be translated from one application's format into the other's or a standard neutral format (e.g. PDF, STEP (Standard for the Exchange of Product model data))).

- Image Services: possibility to view and redline images.

- Administrator services: functions for system set up, access control and backup services.

Crnkovic et al. (2003) further extend this classification to include application integration functionality. Application integration enables to establish a single source for product data management. This is essential for flexible and fast data exchange between distributed development groups (Jansson et al. 2001). Jansson et al. (2001) further highlight the harmonisation of (collaboration) processes in collaborative networks.

Nowadays PDM vendors provide also web clients for their applications (Jansson et al. 2001). These enable, at least, browsing facilities (documents and images). Latest extension to PDM concept is PLM (Product Lifecycle Management (Sääskivuori & Immonen, 2004). Sääksvuori & Immonen (2004) define PLM as follows:

> *"PLM refers to the wider frame of reference of Product Data Management (PDM), especially to the life cycle perspective of information management. According to CIMData (world class PDM consulting company), PLM is a group of systems and methods with which the development, manufacture and management of products is made possible at all the stages of the product life cycle."*

The important aspect of the above definition is the conception of PLM as a generic frame of reference for systems and methods that are needed for managing all product-related data during product's life cycle. However, PLM literature and PLM/PDM tool vendors tend to treat PLM just as a technical extension to PDM tool but it should be considered it in its wider sense as described in the above. So if we compare term PLM to PDM we can conclude that:

- PLM does not refer to any individual computer SW or method, but it is collection of systems and methods with which the development, manufacture and management of products is made possible at all stages of the product life cycle. So PLM highlights consistent usage of various product information management methods and tools (e.g. RM, CM, Document management (DM)) to achieve product lifecycle management.

- Also product data that is collected after product delivery can be essential, e.g. information about implementation, usage, updates, maintenance, etc. This kind of information can be used e.g. for after-sales and maintenance-services (Jansson et al. 2001).
- PLM includes also the creation of product related information and authoring tools. How the product data is produced using these tools and how we get this data under product information management in an organisation?

One interesting aspect in information management is “embedded product information” where product related information (e.g. ID, product configuration, and possible component alternatives) is physically attached into product (e.g. Radio Frequency Identification (RFID)) in order to support e.g. maintenance. RFID tag is placed in product and it consists of identification information which helps in finding the corresponding product information from different information systems in logistics chain.

Jansson et al (2001) states that PDM can provide the following advantages in collaborative environment:

- communication, data exchange and operation is easier in geographically distributed environment
- reuse of information is easier (enables e.g. the preparation of more accurate offers and plans)
- faster product deliveries (parallel development, better project management)
- less mistakes that are caused by deficient and inconsistent information

3.4.2 Requirements for PDM/CM tools in collaborative development

Product information management tools need to face the challenges of collaborative development. PDM/CM tools must be able to provide:

- Data visibility and transfer for external users (e.g. using web)
- Neutral data formats (PDF, html, …) for viewing information (for those who do not have native applications (e.g. MCAD, ECAD tools))
- Cuncurrent development (branching, merging)
- Redlining, annotation capabilities for reviews
- Standard data formats to support data exchange between partners’ applications. E.g. STEP
- Workflow capabilities with communication and notification
- Electronic acceptance/signature in document / design management
- Confidentiality / security
- Component libraries with supplier information
- Data import/export (e.g. to migrate existing data from sub-contractor’s information management system into main-contractor’s information management system)

Most of commercial PDM and CM tools are complex and usually they use a relational database technology. Furthermore, PDM systems usually contain various business-oriented applications or modules (Crnkovic et al. 2003). Nowadays, modern PDM vendors

provide also web clients for their applications (Jansson et al. 2001). PDM implementations are usually quite large-scale activities and therefore vendors provide also consulting services, e.g.:

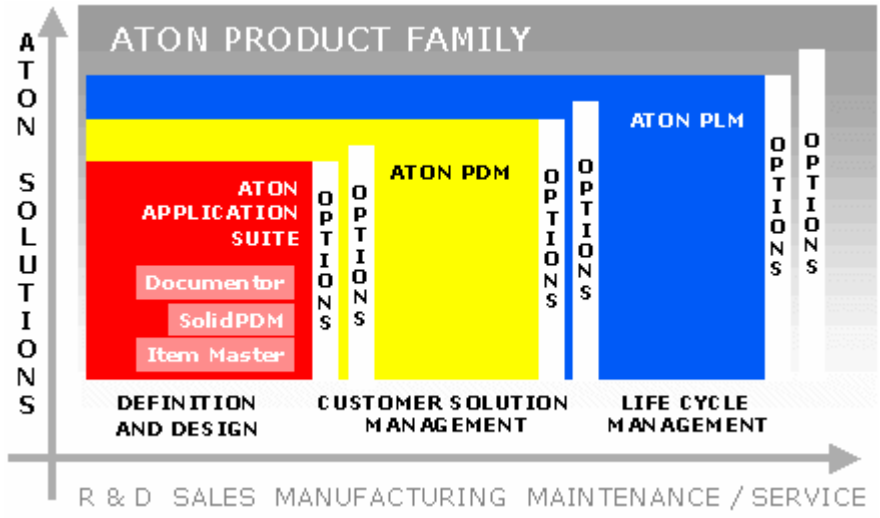
- MatrixOne's RapidValue Program (a structured implementation approach) (http://www.matrixone.com/pdf/matrix10rapidvaluedatasheet.pdf)
- Modultek Action Plan (MAP) (customized implementation of the Aton solution) (http://www.modultek.fi/sivu.aspx?taso=1&id=136)
- Consulting services (PTC, Windchill) (http://www.ptc.com/services/consult/pdtis.pdf)

3.4.3 Aton

Tool:	**Aton**
Company:	Modultek
Description:	

Modultek's Aton product family (Aton Application Suite, Aton PDM, and Aton PLM) has been designed to manage information of products, services, and individual customer solutions in various operational processes.

With the help of these solutions, data created in the processes can be produced, managed, and utilized all the way from R&D to After Sales. Base on its modular structure, the functionality of the selected Aton product can be expanded to meet the individual needs of the company.



Aton PLM contains the following features:

Service product management: Aton PLM transfers service descriptions from text files to manageable structural database objects. This enables the development of an effective service platform from which service entities to be sold to different customers can be composed.

Serial number structure maintenance: A serial number structure's being up-to-date is ensured by user interfaces supporting the maintenance process. The usage of components in serial number structures is indicated with the help of validity dates, i.e. it can be shown which components and their revisions the product consisted of at a particular moment. Subsystem-specific set values can be saved as dynamic attributes or with document relationships.

Traceability: With one query, Aton PLM retrieves those delivered serial numbers in which a component having a certain serial number range has been used. Change notifications can thus be sent only to those customers who use the affected products.

Installed Base Management: Aton PLM also supports the management of third party product data. Data can be transferred from suppliers' systems to the Aton database or it can be referred to with hyperlinks.

Spare part logistics optimization: It can be controlled what kind of machines or systems have been delivered to different maintenance areas, and thus regional spare part stocks can be optimized. Spare parts can be coded specifically by the product brand which makes the usage of pirate spare parts difficult. Aton PLM manages cross references between components produced by different manufacturers.

Embedded Product data: Information related to the management of a delivered serial number can be carried with the product by saving Aton PLM access right codes into different identification devices (RFID, USB/HASP). Using an identification code, a person can log into the supplier's Aton system in any place where the Internet access is available, and find configuration information, spare part structures, and maintenance documentation related to the specific serial number.

Publisher: The Publisher module of the Aton product family provides the maintenance organization with up-to-date product documentation and electronic spare part catalogs. Publisher also functions as a link to spare part sales systems.

Product Configurator: With the Aton Product Configurator product it is possible to automate the company's order-delivery process from sales all the way to production, also taking the needs of after sales into account. The product configurator produces a manufacturing site specific As-Built structure, unique documentation, and spare part sets.Aton Product Configurator also defines individual service products and agreements.

Integrations: Due to standard interfaces, Aton PLM integrates to all systems that are used to manage a product during its life cycle, such as Maintenance systems, CRM, EAI, field bus solutions, telemetric systems, portals. If needed, it is also possible to utilize automated information transfer to both directions

Installable /Web based:	See vendor's web-pages.
URL:	www.modultek.fi/

3.4.4 ClearCase

Tool:	**ClearCase**
Company:	IBM
Description:	

Provides life cycle management and version control of software development assets:

- Enables parallel development.
- Provides workspace management including dynamic view support.
- Uses Unified Change Management — the configurable, activity-based process for managing change.
- Scales from medium to large team with extensive platform support including Windows, Linux and UNIX.
- Provides advanced build management and auditing, including build management for mainframe applications.
- Provides options via Rational ClearCase MultiSite, for geographically distributed teams.
- Integrates with:
    - leading IDEs (WebSphere Studio, Microsoft .NET).
    - IBM Rational Suite and IBM Rational Team Unifying Platform.

	o Web development and authoring tools.
Installable /Web based:	See vendor's web-pages
URL:	www-306.ibm.com/software/awdtools/clearcase/

3.4.5 CVS

Tool:	**CVS**
Company:	Open source community
Description:	
CVS is an open source production quality system in wide use around the world, including many free software projects. – It can run scripts which you can supply to log CVS operations or enforce site-specific polices. – Client/server CVS enables developers scattered by geography or slow modems to function as a single team. The version history is stored on a single central server and the client machines have a copy of all the files that the developers are working on. Therefore, the network between the client and the server must be up to perform CVS operations (such as checkins or updates) but need not be up to edit or manipulate the current versions of the files. Clients can perform all the same operations which are available locally. – In cases where several developers or teams want to each maintain their own version of the files, because of geography and/or policy, CVS's vendor branches can import a version from another team (even if they don't use CVS), and then CVS can merge the changes from the vendor branch with the latest files if that is what is desired. – Unreserved checkouts, allowing more than one developer to work on the same files at the same time. – CVS provides a flexible modules database that provides a symbolic mapping of names to components of a larger software distribution. It applies names to collections of directories and files. A single command can manipulate the entire collection.	
Installable /Web based:	Price: Free
URL:	http://www.nongnu.org/cvs/

3.4.6 Dimensions

Tool:	**Dimensions**
Company:	Serena software
Description:	
With its single metadata repository, shared functionality across platforms from the web to the mainframe, and enterprise build capability, ChangeMan Dimensions provides power and flexibility for managing, tracking and controlling assets. Dimensions supports bi-directional closed-loop integrations with several software development lifecycle tools. ChangeMan Dimensions integrates with Mercury TestDirector/Defect Tracker to automate the QA bug-fix cycle, and with Telelogic DOORS to ensure full requirements traceability across the software development lifecycle.	
Installable /Web based:	See vendor's web-pages
URL:	www.serena.com

3.4.7 Matrix10

Tool:	Matrix10
Company:	MatrixOne
Description:	
Matrix10 PLM environment: **The Matrix PLM Platform** serves as the foundation for the overall Matrix10 environment and is the underlying engine for Matrix10's PLM business process applications, modeling capabilities and third party system integrations. Within the platform is the Modeling Studio, which allows companies to configure processes, interfaces and data schema to ensure they meet business needs. **The MatrixOne Business Process Applications**, which incorporate the best practices of some of the world's most innovative companies, allow companies to improve the way they collaborate with internal and external teams, develop products and work with suppliers and partners. MatrixOne's Business Process Applications are being used across all industries to allow companies to keep geographically dispersed teams connected through access to real-time data and business processes. Matrix10 represents adaptable PLM backbone with dozens of off-the-shelf integrations and technologies to enable seamless data sharing between third-party enterprise applications and desktop authoring tools, including leading spreadsheet, word processing, project management, MCAD, EDA and software development applications.	
Installable /Web based:	See vendor's web-pages
URL:	www.matrixone.com

3.4.8 SourceSafe

Tool:	SourceSafe
Company:	Microsoft
Description:	
SourceSafe is a SW version control system for development team using Microsoft Visual Studio. Historically, problems within the team development environment stem from the inability to work comfortably in a setting sensitive to their projects and source code. While every project requires an adequate level of software management, the costs and overhead associated with file-based version control often outweigh the benefits. By providing project-oriented software management, Visual SourceSafe enables teams to develop with the confidence that their projects and files will be protected. It's simple enough to use right out of the box, and it's integrated with the development environment developers already work in. Integrated features of Visual SourceSafe enable developers to access team development features—all from within the familiar Visual Studio environment they already use. Many features trigger automatically, such as when a file is about to be changed, providing a safety net for team members and ensuring the protection of the project. Share and linking capabilities promote the reuse of code and components across projects and simplify code maintenance by propagating changes across all shared and linked files whenever a file is updated. Parallel development features, such as branching, enable teams to fork the development process into parallel projects and files, creating identical copies that inherit all versioning documentation but may be tracked as new, individual projects. Team members can also reconcile conflicts between different versions of the same file by using a visual merge capability, which provides a point-and-click interface for uniting files and avoids potential loss of valuable changes. As revisions are made, files are added and modified, and the software life cycle grows,	

all changes and documentation are secured by Visual SourceSafe, providing an audit trail for every file and every project, easily accessible to even the novice user.	
Installable /Web based:	Price: Version Upgrade $279 US Estimated Price $549 US See moore information from vendor's web page
URL:	www.microsoft.com

3.4.9 StarTeam

Tool:	**StartTeam**
Company:	Borland
Description:	
Borland StarTeam provides a complete range of software change and configuration management solutions designed to meet the needs of all development teams according to size, geographical distribution, and work style. StarTeam provides a platform for coordinating and managing the entire software delivery process, StarTeam promotes team communication and collaboration through centralized control of all project assets. Protected yet flexible access ensures that team members can work whenever and wherever they like through an extensive choice of Web, desktop, IDE, and command-line clients.	
Installable /Web based:	See vendor's web-pages
URL:	http://www.borland.com/starteam/

3.4.10 Synergy

Tool:	Synergy
Company:	Telelogic
Description:	
Telelogic SYNERGY is Telelogic's tool family for SW change and configuration management. Tool family contains the following solutions: • SYNERGY/CM is a task-based change management software used for the development of advanced software and systems. • SYNERGY/Change is a Web-based, fully integrated change request tracking and reporting system that simplifies the process for change request management and enables organizations to respond to changes from both inside and outside sources. • SYNERGY/Distributed CM is a solution for remote and distributed change management. SYNERGY/Distributed CM enables geographically distributed development teams to work together more efficiently and productively. • Telelogic Dashboard is a management tool that automates the collection, analysis, and reporting of measurement data from SYNERGY/Change. Project managers can extract and leverage data that already exists in SYNERGY/Change and display project status information in a graphical, multi-view format. • SYNERGY/CM ObjectMake is Telelogic SYNERGY's build management capability. • SYNERGY - Microsoft Project integration enables effective and proactive project management, with greater visibility into project activity and more accurate project schedules.	
Installable	Information about Telelogic products and different licences (professional,

/Web based:	education, evaluation licenses) can be found from http://www.telelogic.com/contact/how/buy_try.cfm
URL:	http://www.telelogic.com

3.4.11 Windchill

Tool:	**Windchill**
Company:	PTC (Parametric Technology Corporation)
Description:	
Modular PLM solution containing elements, such as: **Windchill ProjectLink** drives collaborative project management across the entire project team, using online project workspaces to improve communication and coordination. It features project management, CAD integrations, visualization, and project templates to help you streamline all your business processes, from design reviews to portfolio management. **Windchill PDMLink** aggregates and controls a variety of product information, such as requirements, MCAD, ECAD, analysis results, specifications, and service records, throughout the product lifecycle. It enables the global team to access and visualize current product versions, manage changes, and support different organizational views/configurations. **Windchill DynamicDesignLink** fully automates the application engineering process, dramatically reducing the time it takes to configure design-to-order digital products. **Windchill PartsLink** enables part reuse for greater design efficiencies. Users can search the Web-based libraries of internal and external components, preview the parts in a 3D viewer, then drag and drop actual models into an assembly. **Windchill Integrations** captures, controls and shares product information both internally and across enterprise boundaries. It enables communication between Windchill and heterogeneous CAD authoring tools, enterprise systems, and Web technologies. **Windchill ProductView** provides the whole team with access to product information earlier in the product development process. It features embedded capabilities for interactive 2D and 3D visual collaboration, mock-up, prototyping review and study.	
Installable /Web based:	See vendor's web-pages
URL:	www.ptc.com

3.5 TESTING TOOLS

3.5.1 Description and challenges for collaboration

Software testing is often equated to finding bugs from software. However, test scenarios that do not reveal failures are also informative. Software testing is the process of executing a software system to determine whether it matches its specification and executes in its intended environment. The fact that the system is being executed distinguishes testing from code reviews, in which uncompiled source code is read and analyzed statically, usually by developers. Testing, on the other hand, requires a running executable. A specification is a crucial artefact to support testing. It defines correct behaviour so that incorrect behaviour is easier to identify. Incorrect behaviour is a software failure. Failures are caused by faults in the source code, which are often referred to as defects or bugs. Generally, the code developer diagnoses the causal fault. Software can also fail by not satisfying environmental constraints that fall outside the specification. For example, if the code takes too much memory, executes too slowly, or if the product works on one operating system but not another, these are considered failures. (Whittaker 2000)

To plan and execute tests, software testers must consider the software and the function it computes, the inputs and how they can be combined, and the environment in which the software will eventually operate. This difficult, time- consuming process requires technical sophistication and proper planning. Testers must not only have good development skills but also be knowledgeable in formal languages, graph theory, and algorithms. Indeed, creative testers have brought many related computing disciplines to bear on testing problems, often with impressive results. Software testing tools comes forward in this situation; they are designed to help many testing phases, they reduce testing work by automating test runs, help with documentation and reporting and also include many other helpful functions for software testing. (Whittaker 2000)

From the company-collaboration point of view, software testing is not very easy matter to handle. Distributed development teams, differences between methods of working, different company culture, etc. cause many challenges for software testing. Important issues in collaboration are defect management and tracking, change management, testing environments, quality assurance, software modules integration, the use of testing tools and general views to the testing situations and phases.

One approach to deal with this is the use of testing methods. Software development partners should agree upon the testing methods. It would be advantageous, if development partners have same testing tools, and they use same testing methods. Then it is possible to distribute testing work and reduce the overlap. As other development phases, sufficient communication between testing partners is necessary.

Defect management is vital part of software engineering process. With the help of defect/failure databases, it is easier to keep defects and failures in control. Usually failure databases need to provide access to rather many people, customers, users, and developers and so on. This requires robust security verification system and clear rules how to use this kind of databases.

Reuse of test cases would help testing work, particularly in distributed software development. Moreover, it would be useful, if test environments can be used by remote. One of the testing tools promises to support remote testing in some way. This matter

requires broader research and it is hard to say how it works in real life, and is it possible at all.

In the end of development process, software modules from the other manufacturers and subcontractors will be integrated. In this situation testing tools are very practical, and they ease integration testing considerably.

Possibility to check up the status of tests would be practical, meaning that all parties can check which tests are performed and which are not performed. Moreover, it would be practical if parties can ensure which test cases are passed and which not. Since, with the help of tools, bugs can be traced and information to the appropriate party sent.

In this study we found only few testing tools that support collaboration. Actually, most tools that are listed here are in fact so called defect management tools or bug tracking tools, not actually testing tools. This is due to that the main focus of this study was requirements management tools.

3.5.2 Requirements for Testing in collaborative development

- Defect management and tracking. It should be able to manage and track defects that occur during the implementation and testing.
  - Bug tracking and failure databases. When product is being tested, it should be possible to track bugs. When product is ready, it is of advantage if users can report bugs to the failure databases.
- Change management. Testing tool should have change management possibility. If test plan changes, it must be noticed and tool must act accordingly; send notes, messages and notification to the appropriate persons.
- Test environments. When the test environments are similar between parties, testing would be easier to all. Moreover, it would be useful, if test environments can be used remote.
- Quality assurance. The quality of the product should be ensured in some way. Using Quality assurance tool, ensuring quality is easier.
- Integration testing. Collaborative testing tools should support software components integration and integration testing. In general, the focus in the integration testing is on the domain that represents communication and compatibility between the components.
- The use of testing tools. Developers should stipulate for the use of testing tool. Collaborative testing is easier, when parties use the same testing tool and same testing methods.
- General views to the testing situations and phases. When parties can check the current state of the testing, they can be up to date. This should reduce testing overlap.
- Open architecture of testing tool. Collaborative testing tools should have such architecture, that the third party tool can be integrated in it. In other words, it is important that tool includes interface with third party or home developed tools.
- Platform independence. It is important, that collaborative testing tool can be used on different platforms and hardware easily.

3.5.3 ApTest Manager

Tool:	ApTest Manager
Company:	Applied Testing and Technology
Description:	
ApTest Manager provides software test case management, improving consistency, organization, and control throughout the test lifecycle. A single installation of ApTest Manager can be used enterprise-wide, supporting number of tests for number of products. General purpose, Web-based, and configurable, ApTest Manager tries to make better your software testing processes' speed, productivity, and accessibility of information. **Test Definition.** Tests are entered on-line into ApTest Manager's Test Case repository. Test information becomes available to your entire team to document test requirements, test specifications, and test plans; execute repeatable comprehensive test cycles; and review and compare the results of test runs. **Test Execution.** ApTest Manager manages the process of executing test cycles. The tester is shown the requirements, procedures, and environment for each test. When execution of the test is complete test results are entered into ApTest Manager. Consistent procedures and results from one test run to another are thus ensured, whether the same or different personnel perform the testing. **Test Reporting.** Reports can be generated at any time showing the results of testing, both separately and in comparison to other test runs on different product configurations or versions. Test Specifications can be produced as can management reports showing planned versus actual schedules, test runs executed by date, test area, and tester, etc Key features: - Web-based test definition, execution and reporting - Centralized test repository for tests and results - Schedule tracking and reporting of planned to actual time spent - Automated regression comparison of new and previous results - Easy migration for existing tests and procedures - Configurable and flexible - Template-driven - customizable to match existing processes and procedures - Hierarchical Test Suite structure - Tests can be grouped in a variety of user-defined ways - Execution of selected groups of tests - Full user and programmer documentation - Compatible with existing source code control and bug tracking test tools - On-line help - Easy installation and configuration - Test Cases can be easily imported from existing sources (e.g. Excel, Access) - Test Cases can be easily exported to Excel or Access in CSV format	
Installable / Web based:	Installation required.
URL:	http://www.aptest.com/atm2/

3.5.4 ProblemTracker Enterprise Edition

Tool:	**ProblemTracker Enterprise Edition**
Company:	NetResults Corporation
Description:	

ProblemTracker EE is a Web-based collaboration tool to help companies track business issues and bugs and automatically manage them through to resolution. ProblemTracker includes following applications:

- Bug tracking. ProblemTracker can be used by all team members to coordinate their work, and to make sure that reported bugs and enhancement requests won't get forgotten. The engineers can make attachments to the bug records and associate bug records to the files in the source code control system. Meanwhile, Managers can obtain status, reports, charts and graphs showing trends and problem areas. Issues that are not taken care of in time will automatically be escalated. Everyone involved can obtain status, automatic notification, reports, and charts and graphs; and share knowledge and information.
- Issue Tracking and Management. Resolution of issues require the coordination of multiple individuals within and perhaps even outside the company. ProblemTracker can be used by all team members to coordinate their work and to make sure that issues get resolved in a timely manner. The built-in workflow automatically routes these issues to the appropriate individuals. ProblemTracker thus delivers project information and status to team members everywhere to foster better communication and collaboration, and automatically manages these issues to resolution.
- Life cycle Management. A sample software development process may consist of the following stages: design, development, unit testing, system integration, system testing, beta testing, and release. Problems find in any of the steps may require resolving the problems and repeating the earlier steps. In each of the steps, developers need to communicate to make sure that the components developed by each individuals fill work together and to share knowledge and experience. With ProblemTracker it is able to coordinate and track the tasks and development processes automatically. Also, it is able to report and measure the progress of the development continually and provide status, reports, charts, and graphs to everyone who needs to know.
- Change Management. Change control and management are critical to the operation of a company. ProblemTracker enables a company to simplify and automate the change control process. It enables to track, document, and safely implement changes to company resources such as assets, documents, procedures from any location. Also defining tasks for initiators, approvers, implementers, and verifiers are possible, as well as defining and enforcing the change process automatically.
- Process Management. A task often requires the collaboration of several people to complete. Each person, after completing his portion of the task, needs to pass it on to the next person designated to work on that task. ProblemTracker can capture your company's workflows, automatically route the tasks to the appropriate individuals, and enforce the processes.

ProblemTracker is a fully Web-based system. It can be installed to company Web-server or a hosted solution can be purchased.

Installable / Web based:

Two possibilities: Software you can license and install on your Web server or Hosted version, when hardware or software installation is not required.

Price:

Static licenses:

	ProblemTracker	ProblemTracker Enterprise Edition
1 - 10 licenses	$190 each	$240
11-30 licenses	$180 each	$230

	31-50 licenses $175 each $225 **Floating licenses:** 1 - 10 licenses $430 $499 11-20 licenses $420 $489 http://www.problemtracker.com/fs_pt3_price.html (More info about pricing)
URL:	http://www.problemtracker.com/

3.5.5 TestTrack Pro

Tool:	**TestTrack Pro**
Company:	Seapine Software
Description:	
Tracking bugs and feature requests is a part of software development. TestTrack Pro puts improved quality, communication, and reporting within reach. TestTrack Pro is bug tracking program but it's also quality control tool for software development teams. Bug tracking is a team activity involving engineers, testers, managers, and tech writers - even members of the sales and marketing teams can get involved. TestTrack Pro makes it easy to coordinate activities between team members, but most importantly, TestTrack Pro makes it easy to participate. TestTrack Pro's fully customizable workflows let you tailor it to drive your development process. With definable states, events, and state transition rules, you can model your most complex workflow processes. And in addition TestTrack Pro will diagram the workflow for user. TestTrack Pro integrates with third-party source code control applications, such as Microsoft Visual SourceSafe, Merant PVCS, Perforce, and others. This integration enhances your ability to associate specific defects logged in TestTrack Pro with your source code, thus enhancing your product's quality. Because of Web access no matter where you are, at your desk, on the road, or working from home, TestTrack Pro has the tools you need to access your bug database. All of TestTrack Pro's features can be accessed through a Web browser on virtually any operating system or through our Windows client. And, TestTrack Pro's client/server architecture allows you to place your Windows client at any location on the Internet and still access your bugs. TestTrack Pro lets any authorized user look up the current state of any defect at any time. And, TestTrack Pro's comprehensive email notification support is second to none. TestTrack Pro notifies team members by e-mail when bugs are assigned to them or new bugs are added - even when a specific bug changes. TestTrack Pro also includes SMTP- and MAPI-based email notification support. TestTrack Pro offer quality control statistics viewing. With TestTrack Pro one can check who reported the most bugs, how many are still open, or how much time a user spent fixing bugs. Also bug's histories - who found, fixed, and verified it - are available in details.	
Installable / Web based:	Installation required, but offers also possibility for web client use in some cases. Price: Named License list price: $295 Floating License list price: $795 Pricing outside North America may vary by region.
URL:	http://www.seapine.com/ttpro.html

3.5.6 TETware

Tool:	**TETware**
Company:	The Open Group
Description:	
TETware is a Test Management tool, which provides an easy-to-use multi-platform uniform test framework into which local, remote and distributed test suites can be incorporated. It is designed for organizations that are developing software and need to thoroughly test their products across multiple operating systems, the Test Environment Toolkit is a Test Execution Management System that takes care of the administration, reporting, and sequencing of the tests providing a single common user interface for all of the tests that you develop. This product allows test suites to share a common graphical user interface, promoting sharing of test suites both within an organization and between different organizations. Standardization of the test methodology and tools allows testing efforts to focus away from the harness and tools, increasing efficiency and productivity. TETware is being used in a wide diversity of automated testing applications, ranging from: standards API conformance testing; network computer testing; performance and stress testing; and verification of secure electronic transactions; to distributed cross-platform applications. The Test Environment Toolkit provides an easy to use framework which can be built to support: - Local testing. Local testing takes place when a test is executed on the same system that it is installed on and which it's execution is controlled from. No other systems are involved. - Remote testing. In remote testing a test is executed on another system with the result being passed back to the local system. - Distributed testing. A distributed test case has parts that execute simultaneously on either the local system and one or more remote systems, or entirely on two or more remote systems. The different parts are synchronized and contribute towards a single result which is collated on the local system. - Testing on real time and embedded systems. Typically TETware cannot run on a real time system, as the operating system facilities may be limited. Therefore TETware runs on a host system and controls the execution of tests on the target (real time) system.	
Installable / Web based:	Requires installation. Price: TETware Lite $5,800 Distributed TETware $11,600 TETware RT $5,800 For more information: http://tetworks.opengroup.org/purchase.htm
URL:	http://tetworks.opengroup.org/

3.6 NON-CATEGORIZED TOOLS

Tools introduced in this chapter are such tools, that can be used in several software development phases in collaboration. They may support, for example, project management, requirement management and software implementation at the same time, or they can be used in the whole development chain. Because of this, these tools are left out from earlier categories. Following list is not complete, but includes examples of tools.

3.6.1 Collabnet Enterprise Edition

Tool:	**CollabNet Enterprise Edition**
Company:	CollabNet
Description:	
CollabNet Enterprise Edition is a software toolset including extensive selection of tools designed for distributed, internet-based software development. Enterprise Edition comprises Project Workshop, Software Development, Knowledge Management, Communication Management, Project Management, Security & Permissions and Specifications. Software Development includes following solutions for collaborative software development: - CollabNet SCM (Software Configuration Management), a versioning system designed for distributed, Internet-based development, manages changes to files and directories. Using CollabNet SCM, a tree of files is placed into a central repository. The repository is similar to ordinary file storage, except that every change ever made to the files and directories is tracked. This allows recovery of older versions of data, or examination of the history of changes to data. - Version Control. The CollabNet collaborative development environment manages the details of software development for both geographically centralized and geographically distributed projects. The CollabNet environment allows quick comparisons between any existing versions by storing and tracking the versions of the evolving code. - Issue Tracker provides the ability to identify and track various items that need to be completed in conjunction with a project. The CollabNet Enterprise Edition collaborative development environment provides five categories of issues: Defect, Enhancement, Feature, Patch, and Task. Users enter issues as they arise and follow them from concept to completion. The CollabNet environment notifies those experts best suited to deal with each of the issues. - Project Tracker is a highly configurable artifact tracking tool that allows domain and project administrators to set the data definition for tracking any number of different types of artifacts. The primary use of Project Tracker is tracking defect information and it is also simple to create ways to track requirements, tasks, enhancement requests, and other artifacts in the CollabNet environment project workspace. - IDE Integration. The CollabNet Enterprise Edition collaborative development environment supports integration with many popular integrated development environments (IDEs), which enables developers to utilize their existing tools. These include: Borland JBuilder, Eclipse, Oracle9i JDeveloper, Sun NetBeans, and Sun SunONE Studio, among others. - Bridge for IBM Rational ClearCase allows you to transfer source code between IBM Rational ClearCase and the CollabNet environment.	
Installable / Web based:	Web based.
URL:	http://www.collab.net/products/index.html

3.6.2 Cradle

Tool:	Cradle
Company:	3SL
Description:	
Cradle is a multi-user, multi-project, systems engineering environment that spans the entire systems and software development lifecycle. Building on a scalable, extensible, distributed and web-enabled repository, Cradle provides a suite of tools that integrate all project phases, activities and deliverables within a single, configuration managed, access controlled framework. It is able to tailor this framework to projects, combining desktop tools such as Word and Excel, with specialist engineering and project management tools and corporate PDM / EDM solution into a seamlessly managed whole that can be distributed site-wide, company-wide or project-wide using web and non-web technologies. Cradle provides solution for the entire development lifecycle for software products including requirements issues, system modelling, reverse engineering, document generation and other model based systems engineering tasks.	
Installable / Web based:	Installation required.
URL:	http://www.threesl.com/

3.6.3 Eclipse

Tool:	Eclipse Platform 3.xx
Company:	Eclipse.org Consortium
Description:	
The Eclipse Platform is designed for building integrated development environments (IDEs). It can be used to create for example embedded Java programs, C++ programs, and Enterprise JavaBeans. Except for a small kernel known as the Platform Runtime, all of the Eclipse Platform's functionality is located in plug-ins. Plug-in is some kind of a building block, which is constructed to do some specified task. Eclipse supports team working with Concurrent Versions System (CVS) team programming environment. Every team members do their work in their own Workbenches that are isolated from others. Sharing work is carried out by using CVS Repository. The Eclipse Platform's principal role is to provide tool providers with mechanisms to use, and rules to follow, that lead to seamlessly-integrated tools. It also provides useful building blocks and frameworks that facilitate developing new tools. ***The Eclipse Platform is designed to meet the following requirements:*** - Support the construction of a variety of tools for application development - Support an unrestricted set of tool provider, including independent software vendors (ISVs) - Support tools to manipulate arbitrary content types (HTML, Java, C, JSP, jne.) - Facilitate seamless integration of tools within and across different content types and tool providers - Run on a wide range of operating systems, including e.g. Windows and Linux - Capitalize on the popularity of the Java programming language for writing tools As mentioned before, the Eclipse Platform offers possibility to extend its functionality by plug-ins. The total amount of plug-ins is huge and they offer a lot of functionality for collaborative software development. There exists plug-ins for Project Management, Team programming, Pair-programming, File sharing, p2p-chat etc. For example, with the one of the plug-ins it is possible to edit a source code file from the different locations concurrently. The second example is plug-in	

that offers integration with CVS, team presence, messaging and chat, application sharing and etc. Moreover, there is also a couple of plug-ins that enables integration of third party tools to the Eclipse Platform. One of the tool could be for example Rational ClearCase, which is a version control and -management tool. As can be seen, The Eclipse Platform offers indeed a lot of potential features and plug-ins for collaborative software development.	
Installable / Web based:	Installation required. Price: - Free of charge - Multiplicity of plug-ins that are either free or chargeable - An open source tool
URL:	http://www.eclipse.org

3.6.4 Focal Point Platform

Tool:	**Focal Point Platform**
Company:	Focal Point
Description:	
Focal Point Platform is a software tool that support decision-making, product management, requirements management and portfolio management. It also supports stakeholders' collaboration, prioritization, visualization and other business activities. Focal Points aspect is that requirements management is about making the right products with the right features at the right time for the right customers. This process requires advanced decision making capabilities, as well as in-depth and proactive administration through the entire requirement lifecycle. Focal Point supports the decision making process across all release planning processes. Focal Point supports customers analysis by helping companies to collect needs and requirements from customers, let customers prioritizes their needs and visualizes these in charts. It also supports Risk Management, Product Planning and Competitor analysis. Focal Point is a web server application, thus no client installations are necessary. It can be tailored to fit needs of any company.	
Installable / Web based:	Focal Point is a true web server application, thus no client installations are necessary.
URL:	http://www.focalpointus.com/

3.6.5 MKS Integrity Suite

Tool:	MKS Integrity Suite
Company:	MKS

Description:

Since software developers had numerous remote development teams, it was important for them to have a reliable and secure way to collaborate in a distributed environment. The MKS Integrity Solution's multi-tier client/server architecture provided the perfect platform for communication between client and server across long distances. It allowed remote developers to connect with developers from different locations, ensuring good productivity.

The MKS Integrity Suite is a suite of products provide software change management coupled with flexible process and workflow. It is suited to the needs of global IT teams who can leverage existing technology investments and skills, enhance development team productivity and increase overall software quality, accelerating time to market, increasing revenues and reducing overall business risk.

Components of the MKS Integrity Suite include:

- **MKS Requirements** for right-weight requirements management. MKS Requirements is the product to provide a single solution for integrated requirements capture and traceability through every stage of the software development process, while ensuring collaboration between software development and business users. MKS Requirements is a solution if seeking combination of requirements and process management. MKS Requirements offers for example integration with Microsoft word, traceability between business requirements, functional requirements, features, tasks, source code changer and deployment artefacts. Other features are management reporting, changes capturing and notification for appropriate personnel, and historical reporting. MKS Requirements offers requirements management tool that covers design, development, testing and deployment phases of the application lifecycle.
- **MKS Integrity Manager** for process and workflow management and defect tracking. MKS Integrity Manager is the enterprise choice for process and workflow management, helping create repeatable processes for managing software development. It marries with MKS Source Integrity Enterprise for full enterprise software configuration management, is the foundation for MKS Requirements for requirements management and integrates other developer productivity tools to leverage software investments and enhance coverage of the software development lifecycle. A configurable management dashboard delivers real time charts and metrics for decision support. MKS Integrity Manager's platform architecture is scalable across the enterprise to support distributed developers and other constituents in the change process.
- **MKS Source Integrity Enterprise** for software configuration management, version control and globally distributed team development. MKS Source Integrity Enterprise Edition is the enterprise choice for cross-platform software configuration management. It enables secure and flexible process-centric management for local and distributed development teams in the enterprise.
- **OpenMake** for enterprise build management. Openmake is a software development tool designed to automate the creation of reliable applications through the use of a repeatable software build process. It eliminates risks associated with developing enterprise applications by ensuring that executables are created according to an organization's business objectives the same way every time.
- **MKS Build and Deploy** for deployment management to production environments. MKS Build & Deployment is a workflow-focused tool that helps organizations reduce the risk of deployment errors and decrease deployment costs. With MKS Build & Deployment, changes to your enterprise software systems are deployed accurately, eliminating errors that are common when employing a manual process.

Installable / Web based:	Not known.
URL:	http://www.mks.com/solutions

3.6.6 think project!

Tool:	**think project!**
Company:	AEC Communications
Description:	

Business processes in all industries which are project-oriented are increasingly marked by a high level of division of labour. Cross-company and cross-country teams must master more and more complex planning tasks, projects and processes together.

- With think project! business processes, owners can manage and structure their individual workflows and collaborate and communicate seamlessly in an efficient way with clients, suppliers, subcontractors, partners and customers.
- think project! dynamic forms can be integrated into business processes between organisations which are being used to accomplish all workflow tasks and automate business processes beyond the company network.
- All information, data, communication from inside or outside your organisation including but not limited to RFI/RFQ , change requests, orders, approvals, variations or instruction.
- Processes are fully documented, archived and structured and are available for all internal sub processes like auditing, reporting or cost controlling.

think project! system consists of 3 core elements and services:

- **Dynamic Forms and Workflow Generator.** With think project! it is able to create and configure document forms and templates and combine them to individual workflow processes. The dynamic filter concept allows searching and browsing through numbers of document repositories and is able to filter out relevant information, such as the latest document version or outstanding personal tasks. Adaptable document forms and collaborative filters can be managed on a company or project administration level and can be designed and pre-defined to the business requirements. Large amounts of paper-based documents uploaded within think project! can be searched by full text through an OCR software module.
- **Communication and Correspondence.** think project! has a communication concept which allows companies to collaborate internally and externally with project partners. It supports all kinds of communication channels like webmail, email, fax, sms or company letters. The communication concept is linked to all other components within the software so that, for example, numbers of documents can be filtered by selecting message relevant information. It is also possible to structure entire communication across their organization and multiple projects and processes.
- **Application Integration.** think project! follows an open software architecture which allows interfaces to other enterprise & corporate software, as well as interfaces between different portal applications or billing interfaces to third party software. It also allows viewer and redlining file collaboration component capable of displaying more than 250 formats. think project! uses web service components internally between different core portal offerings and also between clients and the portal software, for example printing on demand, unified messaging services and report generation. think project! is integrated with MS Office to work with Word forms and templates as well as the import/export functionality.

Installable / Web based:	No client installation,
URL:	http://www.aeccom.com/

4. SUMMARY

In this white paper a state-of-the-art literature analysis of collaboration tools has been presented. Sources for this research are literature, internet and reports and experiences from previous projects.

The first part of the document contains tools that can be used to support collaboration in general during a project lifecycle.

In the second part of the document software tools that enable collaborative software development in multi-organisational viewpoint was presented. The tools cover: Project Management, Requirements Management, Product Data Management & Configuration Management and Testing. Characteristics and challenges for each tool category were described including the requirements for the tool support. Although the main topic of the part was Requirements Management tools, also examples of Project Management, Configuration Management and Testing tools were included.

Some of the tools support only a part of software development process such as requirements engineering, -management and -tracing. There are also tools which could be used in during the entire development life-cycle. Some of these tools were discussed in section 3.6 Non-categorised tools.

Every tool category included a list of tools that presents information collected from vendors' web-pages. As the total amount of tools is huge, rather an insight for available tools not a comprehensive list has been provided.

Tools included in this white paper have been chosen based on the tool vendors promise to support collaboration; based on the information in their web-sites and white papers, potential support for the collaborative development was estimated. In this way the functions and features that tools provide for collaboration was easy to find and, therefore, more tools could be covered in the survey. Another approach could have been to set conditions and requirements to the appropriate tools first, and then analyze how they meet those requirements. This will be the way companies may select the tools for their purposes.

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