OM-1
Identifying knowledge-oriented problems and opportunities in the organization

Organization Model	Problems and Opportunities Worksheet OM-1
PROBLEMS AND OPPORTUNITIES	Make a shortlist of perceived problems and opportunities, based on interviews, brainstorm and visioning meetings, discussions with managers, etc.
ORGANIZATIONAL CONTEXT	Indicate in a concise manner key features of the wider organizational context, so as to put the listed opportunities and problems into proper perspective. Important features to consider are: 1. Mission, vision, goals of the organization 2. Important external factors the organization has to deal with 3. Strategy of the organization 4. Its value chain and the major value drivers
SOLUTIONS	List possible solutions for the perceived problems and opportunities, as suggested by the interviews and discussions held, and the above features of the organizational context.

OM-2

Description of organizational aspects that have an impact on and/or are affected by chosen knowledge solutions

Organization Model	Variant Aspects Worksheet OM-2
STRUCTURE	Give an organization chart of the considered (part of the) organization in terms of its departments, groups, units, sections, ...
PROCESS	Sketch the layout (e.g., with the help of a UML activity diagram) of the business process at hand. A process is the relevant part of the value chain that is focused upon. A process is decomposed into tasks, which are detailed in worksheet OM-3.
PEOPLE	Indicate which staff members are involved, as actors or stakeholders, including decision makers, providers, users or beneficiaries ("customers") of knowledge. These people do not need to be actual people, but can be functional roles played by people in the organization (e.g., director, consultant)
RESOURCES	Describe the resources that are utilized for the business process. These may cover different types, such as: 1. Information systems and other computing resources 2. Equipment and materials 3. Technology, patents, rights
KNOWLEDGE	Knowledge represents a special resource exploited in a business process. Because of its key importance in the present context, it is set apart here. The description of this component of the organization model is given separately, in worksheet OM-4 on knowledge assets.
CULTURE & POWER	Pay attention to the unwritten rules of the game, including styles of working and communicating ("the way we do things around here"), related social and interpersonal (nonknowledge) skills, and formal as well as informal relationships and networks.

OM-3

Description of the process in terms of the tasks it is composed of, and their main characteristics

Organization Model	**Process Breakdown Worksheet OM-3**					
NO.	TASK	PERFORMED BY	WHERE?	KNOWLEDGE ASSET	INTENSIVE?	SIGNIFICANCE
task identifier	task name (some part of the process in OM-2)	a certain agent, either a human (see 'People" in OM-2) or a software system (see "Resource" in OM-2))	some location in the organization structure (see OM-2)	list of knowledge resources used by this task	boolean indicating whether the task is considered knowledge-intensive?	indication of how significant the task is considered to be (e.g., on a five-point scale in terms of frequency, costs, resources or mission criticality)

OM-4

Description of the Knowledge component of the organization model and its major characteristics

Organization Model		**Knowledge Assets Worksheet OM-4**				
KNOWL-EDGE ASSET	POS-SESSED BY	USED IN	RIGHT FORM?	RIGHT PLACE?	RIGHT TIME?	RIGHT QUALITY?
Name (cf. worksheet OM-3)	Agent (cf. worksheet OM-3)	Task (cf. worksheet OM-3)	(Yes or no; comments)	(Yes or no; comments)	(Yes or no; comments)	(Yes or no; comments)

OM-5
Checklist for the feasibility decision document

Organization Model	Checklist for Feasibility Decision Document: Worksheet OM-5
BUSINESS FEASIBILITY	For a given problem/opportunity area and a suggested solution, the following questions have to be answered: 1. What are the expected benefits for the organization from the considered solution? Both tangible economic and intangible business benefits should be identified here. 2. How large is this expected added value? 3. What are the expected costs for the considered solution? 4. How does this compare to possible alternative solutions? 5. Are organizational changes required? 6. To what extent are economic and business risks and uncertainties involved regarding the considered solution direction?
TECHNICAL FEASIBILITY	For a given problem/opportunity area and a suggested solution, the following questions have to be answered: 1. How complex, in terms of knowledge stored and reasoning processes to be carried out, is the task to be performed by the considered knowledge-system solution? Are state-of-the-art methods and techniques available and adequate? 2. Are there critical aspects involved, relating to time, quality, needed resources, or otherwise? If so, how to go about them? 3. Is it clear what the success measures are and how to test for validity, quality, and satisfactory performance? 4. How complex is the required interaction with end users (user interfaces)? Are state-of-the-art methods and techniques available and adequate? 5. How complex is the interaction with other information systems and possible other resources (interoperablity, systems integration)? Are state-of-the-art methods and techniques available and adequate? 6. Are there further technological risks and uncertainties?
Project feasibility	For a given problem/opportunity area and a suggested solution, the following questions have to be answered: 1. Is there adequate *commitment* from the actors and stakeholders (managers, experts, users, customers, project team members) for further project steps? 2. Can the needed *resources* in terms of time, budget, equipment, staffing be made available? 3. Are the required *knowledge* and other *competences* available? 4. Are the *expectations* regarding the project and its results realistic? 5. Are the *project organization* and its internal as well as external *communication* adequate? 6. Are there further project risks and uncertainties?
Proposed actions	This is the part of the feasibility decision document that is directly subject to managerial commitment and decision making. It weights and integrates the previous analysis results into recommended concrete steps for action: 1. *Focus:* What is the recommended focus in the identified problem-opportunity areas? 2. *Target solution:* What is the recommended solution direction for this focus area? 3. What are the expected *results, costs, and benefits*? 4. What *project actions* are required to get there? 5. *Risks:* If circumstances inside or outside the organization change, under what *conditions* is it wise to reconsider the proposed decisions?

TM-1
Refined description of the tasks within the target process

Task Model	Task Analysis Worksheet TM-1
TASK	Task identifier and task name
ORGANIZATION	Indicate the business process this task is a part of, and where in the organization (structure, people) it is carried out
GOAL AND VALUE	Describe the goal of the task and the value that its execution adds to the process this task is a part of
DEPENDENCY AND FLOW	*Input tasks*: tasks delivering inputs to this task *Output tasks*: tasks that use (some of) the outputs of this task You can use a data-flow diagram or an activity diagram here to describe this.
OBJECTS HANDLED	*Input objects*: The objects, including information and knowledge items, that are input to the task *Output objects*: The objects, including information and knowledge items, that are delivered by the task as outputs *Internal objects* Important objects (if any), including information and knowledge items, that are used internally within the task but are not input or output to other tasks You may want to include a class diagram here to describe the information objects handled by the task.
TIMING AND CONTROL	Describe frequency and duration of the task. Describe the control relation with other tasks. For this you may want to use a state diagram or a activity diagram. Describe control constraints: (i) *preconditions* that must hold before the task can be executed; (ii) *postconditions* that must hold as result of execution of the task.
AGENTS	The staff members and/or the information systems (cf. OM-2 and OM-3) that are responsible for carrying out the task
KNOWLEDGE AND COMPETENCE	Competences needed for successful task performance. For the knowledge items involved, there is a separate worksheet TM-2. List other relevant skills and competences here. Indicate which elements of the task are knowledge intensive. Note that tasks can also *deliver* competences to the organization, and it may be worthwhile to indicate that here.
RESOURCES	Describe and preferably quantify the various resources consumed by the task (staff time, systems and equipment, materials, financial budgets. The description is typically a refinement of the resource descriptions in OM-2
QUALITY AND PERFORMANCE	List the quality and performance measures that are used by the organization to determine successful task execution

TM-2

Specification of the knowledge employed for a task, and possible bottlenecks and areas for improvement

Task Model	**Knowledge Item Worksheet TM-2**
NAME	Knowledge item
POSSESSED BY	Agent
USED IN	Task identifier and name.
DOMAIN	Wider domain the knowledge is embedded in (specialist field, discipline, branch of science or engineering, professional community)

Nature of the knowledge		**Bottleneck / to be improved?**
Formal, rigorous		
Empirical, quantitative		
Heuristic, rules of thumb		
Highly specialized, domain-specific		
Experience-based		
Action-based		
Incomplete		
Uncertain, may be incorrect		
Quickly changing		
Hard to verify		
Tacit, hard to transfer		

Form of the knowledge		
Mind		
Paper		
Electronic		
Action skill		
Other		

Availability of knowledge		
Limitations in time		
Limitations in space		
Limitations in access		
Limitations in quality		
Limitations in form		

AM-1
Agent specification according to the CommonKADS agent model

Agent Model	Agent Worksheet AM-1
NAME	*Name of the agent*
ORGANIZATION	Indicate how the agent is positioned in the organization, as inherited from the organization-model worksheet descriptions, including the type (human, information system), position in the organization structure, ...
INVOLVED IN	List of tasks (cf. TM-1)
COMMUNICATES WITH	List of agent names
KNOWLEDGE	List of knowledge items possessed by the agent (cf. TM-2)
OTHER COMPETENCES	List of other required or present competences of the agent
RESPONSIBILITIES AND CONSTRAINTS	List of responsibilities the agent has in task execution, and of restrictions in this respect. Constraints may refer to limitations in authority, but also to inside or outside legal or professional norms, or the like.

OTA-1
Checklist for the impacts and improvements decision document

Organization, Task, Agent Models	**Worksheet OTA-1: Checklist for Impact and Improvement Decision Document**
IMPACTS AND CHANGES IN ORGANIZATION	Describe which impacts and changes the considered knowledge system solution brings with respect to the organization, by comparing the differences between the organization model (worksheet OM-2) in the current situation, and how it will look in the future. This has to be done for all (variant) components in a global fashion (specific aspects for individual tasks or staff members are dealt with below). 1. Structure 2. Process 3. Resources 4. People 5. Knowledge 6. Culture & power
TASK/AGENT-SPECIFIC IMPACTS AND CHANGES	Describe which impacts and changes the considered knowledge system solution brings with respect to individual tasks and agents, by comparing the differences between the task and agent models (worksheets TA-1/2 and AM-1) in the current situation, and what they will look like in the future. It is important to look not only at the staff members directly involved in a task but also other actors and stakeholders (decision-makers, users, clients). 1. Changes in task layout (flow, dependencies, objects handled, timing, control) 2. Changes in needed resources 3. Performance and quality criteria 4. Changes in staffing, involved agents 5. Changes in individual positions, responsibilities, authority, constraints in task execution 6. Changes required in knowledge and competences 7. Changes in communication
ATTITUDES AND COMMITMENTS	Consider how the individual actors and stakeholders involved will react to the suggested changes, and whether there will be a sufficient basis to successfully carry through these changes
PROPOSED ACTIONS	This is the part of the impacts and improvements decision document that is directly subject to managerial commitment and decision-making. It weights and integrates the previous analysis results into recommended concrete steps for action: 1. *Improvements:* What are the recommended changes, with respect to the organization, as well as individual tasks, staff members, and systems? 2. *Accompanying measures:* What supporting measures are to be taken to facilitate these changes (e.g., training, facilities) 3. What further *project action* is recommended with respect to the undertaken knowledge system solution? 4. *Expected results, costs, benefits*: reconsider items from the earlier feasibility decision document 5. If circumstances inside or outside the organization change, under what *conditions* is it wise to reconsider the proposed decisions?

KM-1
Checklist for the "Domain Documentation Document"

Knowledge Model	**Worksheet KM-1: Checklist Knowledge-Model Documentation Document**
Document entry	**Description**
KNOWLEDGE MODEL	Full knowledge-model specification in text plus selected figures.
INFORMATION SOURCES USED	Listing of all the information sources about the application domain that were consulted. This list is first produced during the identification stage.
GLOSSARY	Listing of application-domain terms together with a definition, in textual form or other. Using Internet technology, one can create a glossary with hyperlinks to text and pictures that explains the terms.
COMPONENTS CONSIDERED	List of potentially reusable components that were considered in the identification stage, plus a decision and a rationale for why the component was or was not used. The components are typically of two types: task-oriented (e.g., task templates) and domain-oriented (e.g., ontologies, knowledge bases).
SCENARIOS	A list of the scenarios for solving application problems collected during the model-construction process.
VALIDATION RESULTS	Description of the result of validation studies, in particular paper-based simulation and/or computer simulations (prototyping).
ELICITATION MATERIAL	Include material gathered during elicitation activities (e.g., interview transcripts) in appendices.

CM-1

Specifying the transactions that make up the dialogue between two agents in the Communication Model

Communication model	Transaction Description Worksheet CM-1
TRANSACTION IDENTIFIER/NAME	A transaction is to be defined for each information object that is output from some leaf task in the task model or in the knowledge model (i.e., a transfer function), and that must be communicated to another agent for use in its own tasks. The name must reflect, in a user-understandable way, what is done with this information object by the transaction. In addition to the name, give a brief explanation here of the purpose of the transaction.
INFORMATION OBJECT	Indicate the (core) information object, and between which two tasks it is to be transmitted.
AGENTS INVOLVED	Indicate the agent that is sender of the information object, and the agent that is receiving it.
COMMUNICATION PLAN	Indicate the communication plan of which this transaction is a component.
CONSTRAINTS	Specify the requirements and (pre)conditions that must be fulfilled so that the transaction can be carried out. Sometimes, it is also useful to state post-conditions that are assumed to be valid after the transaction.
INFORMATION EXCHANGE SPECIFICATION	Transactions can have an internal structure, in that they consist of several messages of different types, and/or handle additional supporting information objects such as explanation or help items. This is detailed in worksheet CM-2. At this point, only a reference or pointer needs to be given to a later info exchange spec.

CM-2

Specifying the messages and information items that make up an individual transaction within the Communication Model

Communication model	Information Exchange Specification Worksheet CM-2
TRANSACTION	*Give the transaction identifier and the name of which this information exchange specification is a part.*
AGENTS INVOLVED	1. **Sender**; agent sending the information item(s) 2. **Receiver**: agent receiving the information item(s)
INFORMATION ITEMS	List all information items that are to be transmitted in this transaction. This includes the ('core') information object the transfer of which is the purpose of the transaction. However, it may contain other, supporting, information items, that, for example, provide help or explanation. For each information item, describe the following: 1. **Role**: whether it is a *core* object, or a *support* item. 2. **Form**: the syntactic form in which it transmitted to another agent , e.g., data string, canned text, a certain type of diagram, 2D or 3D plot. 3. **Medium**: the medium through which it is handled in the agent-agent interaction, e.g., a pop-up window, navigation and selection within a menu, command-line interface, human intervention.
MESSAGE SPECIFICATIONS	Describe all messages that make up the transaction. For each individual message describe: 1. **Communication type**: the communication type of the message describing its intention ("illocutionary force," in speech-act terminology). 2. **Content**: the statement or proposition contained in the message. 3. **Reference**: in certain cases, it may be useful to add a reference to, for example, what domain knowledge model or agent capability is required to be able to send or process the message.
CONTROL OVER MESSAGES	Give, if necessary, a control specification over the messages within the transaction. This can be done in pseudocode format or in a state-transition diagram, similar to how the control over transaction within the communication plan is specified. The difference is just the level of detail.

DM-1
System architecture description

Design Model	Worksheet DM-1: System Architecture
Architecture decision	**Format**
SUBSYSTEM STRUCTURE	Refer to diagram with subsystems. *One can also refer here to standard subsystem structures such as a repository model, a client-server model, MVC model, abstract machine model, . . .*
CONTROL MODEL	Characterization of the overall system control regimen. *E.g., event-driven, centralized control, call-return model, . . .*
SUB-SYSTEM DECOMPOSITION	Refer to diagrams in which subsystems are being decomposed. *Indicate for each decomposition the paradigm underlying the decomposition, e.g., object-oriented or function-oriented.*

DM-2

Specification of the facilities offered by the in which the target system will be implemented

Design Model	Worksheet DM-2: Target Implementation Platform
SOFTWARE PACKAGE	Name of the software package
POTENTIAL HARDWARE	Hardware platforms the package runs on
TARGET HARDWARE	Platform the software will actually run on
VISUALIZATION LIBRARY	Library available? Facilities for views: automatic updates, etc.
LANGUAGE TYPING	Strong vs. weak typing. Full O-O typing? Including multiple inheritance?
KNOWLEDGE REPRESENTATION	Declarative or procedural? Possibility to define rule sets?
INTERACTION PROTOCOLS	Protocols supported for interacting with the outside world: ODBC, CORBA, ...
CONTROL FLOW	Message-passing protocol? Multiple threads of control?
COMMONKADS SUPPORT	Does the software provide an implemented CommonKADS architecture, e.g., through a library package? Does it support a link with a CASE tool for CommonKADS analysis, e.g., reading in knowledge-model and communication-model descriptions?

DM-3
Checklist of decisions with respect architecture specification

Design Model	**Worksheet DM-3: Architecture Specification**
Architecture component	**Typical decision points**
CONTROLLER	Mechanisms for internal/external event handling. Concurrency? Interrupts possible? Allow what-if scenarios? User control over reasoning strategy?
TASK	Can a task fail? Initialization method.
TASK METHOD	Language for control structure. Define where and in what way the internal method control is specified: declarative or procedural.
INFERENCE	Define internal state variable; when should this variable be reset, e.g., after task completion? Define operations for execution and "probe" tests (has-solution?, new-solution?).
INFERENCE METHOD	Many-to-many mapping from inference to inference method. Algorithm should be selected. Catalog of inference methods?
DYNAMIC ROLE	Data types for roles. Access/modification operations for each data type.
STATIC ROLE	Define access operation: give-all, give-one, exists-one?
KNOWLEDGE BASE	Decide about rule-instance representation. Define access and modify/analyze methods. Cf. the domain-expert interface.
VIEWS	Standard graphical direct-manipulation interface? Special facilities required (e.g., natural language production)? Different interface: end-user, expert-user. Provide generic tracing facilities?

DM-4
Application-Design Decisions

Design Model	Worksheet DM-4: Application Design	
Element	**Design decision**	**Comments**
CONTROLLER	Translate communication-plan control plus the transactions into event handlers.	*Need for real-time behavior? Need for concurrency? Need for user control over reasoning?*
TASK METHODS	Formalize control structure.	*Strongly constrained by control language provided by the architecture. Some mapping tools already do this task for you.*
DYNAMIC ROLES	Choose a datatype for each role.	*Constrained by datatypes provided by architecture. Use real role sets (instead of lists) whenever possible, as it leads to more natural reasoning behavior (random selection).*
INFERENCES	Write a specification of the invocation of the inference method(s).	*This method invocation should show how the dynamic and static roles map onto arguments of the method. Often, some "massaging" of the inputs is necessary, as the role representation of (static) roles are purposely not optimized for reasoning purposes.*
INFERENCE METHODS	Specify or select inference methods.	*Choose an appropriate reasoning technique or algorithm. Limit the number of methods by trying to use a method for more than one inference.*
KNOWLEDGE BASES	Translate knowledge-base instances into the representational format provided by the architecture.	*Some mapping tools already do this task for you.*
VIEW OBJECTS	Select appropriate views for the application-model and the controller objects.	*For the end-user interface: use as much as possible domain-specific representations.*

PM-1

How to describe a model state, as an objective to be achieved by the project

Project Management		**Risk Assessment Worksheet PM-1**			
RISK	AFFECTED QUALITY FEATURE	LIKELI-HOOD OF OCCUR-RENCE	SEVERITY OF EFFECT ON PROJECT	RANK OF RISK	COUNTER-MEASURE
Risk identifier and nature	Quality feature at stake due to risk	Very low, low, medium, high, very high	Very low, low, medium, high, very high	Ranking number, based on product of likelihood and effect	Action to be taken against risk

PM-2
Worksheet for carrying out project risk identification and assessment

Project Management	**Model State Planning Worksheet PM-2**
Attribute	**Description**
MODEL NAME	One of the CommonKADS models: organization, task, agent, knowledge, communication, design model.
STATE VARIABLE	A part or component(s) of the selected model on which project work is to done (e.g., the inference layer of the knowledge model).
STATE VALUE	An indicator of the degree of completion to be achieved by the work on the selected model component(s). The following qualitative five-point range is useful: **1. Empty:** The starting state value, indicating that no work has been done yet. **2. Identified:** Basic features relating to the selected model component(s) have been listed. These may refer to essential characteristics of the model component (e.g., the task decomposition shows the typical features of an assessment type of task), identifying external requirements and inputs (e.g., listing the information sources that will be used for the work on the model). **3. Described:** The modelling or implementation work has been fully carried out. This is the level of a complete first version or draft. **4. Validated:** The work done is tested, verified, and validated with respect to outside criteria or sources (e.g., against given quality measures, external requirements, or by checking the correctness of developed models with relevant experts). **5. Completed:** The work on the model component is finished according to the established acceptance criteria (e.g., being accepted and signed off after a review with the client).
QUALITY METRICS	The quality metrics according to the quality plan that will be used to measure whether the desired model state has indeed been achieved. Also, the procedure to establish this is to be indicated here.
ROLE	This is an optional attribute of a model state. It can be used to indicate that a model state plays a specific role in a project, e.g., as a milestone at which a go/no-go decision is to be taken.
DEPENDENCIES	This is an optional attribute: sometimes it is useful to indicate that achievement of a model state critically depends on certain external inputs (e.g., a management decision to be taken, equipment to be available, or results from another part of the project to be finished).