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Executive Summary

This handbook describes IDA, a method for analysing information demand, based on the work performed within the two research projects InfoFlow 1 and InfoFlow 2. The handbook covers the method in terms of background, framework and included parts, as well as how these different parts are used pragmatically. The use of the method and its parts is illustrated by means of an example case.

Keywords: Information Demand, Enterprise Modelling, Context, Information Flow, Method Engineering, Method Development, Method Component.
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1 Information Demand Analysis – Background and Overview

1.1 Background

This handbook was originally written as a part of the research project; *Information Logistics for SME: Improving information flow based on information demand patterns (InfoFlow)* and have then, within the continuation project; *InfoFlow 2*, evolved into the text you now are reading. The two InfoFlow projects have been funded by the Swedish Knowledge Foundation and been run as a cooperation between a number of academic and industrial partners:

- **School of Engineering, Jönköping University** (Sweden)
- **SYSteam AB** (Sweden)
- **Kongsberg Automotive AB** (Sweden)
- **Proton Group** (Sweden)
- **Centrum for Information logistics** (Sweden)
- **Jönköping International School of Business** (Sweden)
- **Linköping Institute of Technology** (Sweden)
- **Fraunhofer ISST** (Germany)
- **Skye Consulting AB** (Sweden)

The purpose with the two projects has been to develop methods and tools to improve and simplify information management within small- and medium sized enterprises (SME), based on experiences from previous projects within the area of information logistics. Focus has mainly been on supporting and facilitating the development of solutions for demand-driven information supply directed towards individuals within such organisations.

A major goal within the two projects has therefore been to develop a method for identification and analysis of information demand within SME, with the specific purpose to improve the understanding of the information flow present in such organisations. The intention being to develop a domain-independent solution that can be adapted to the demands and requirements of a specific situations, to in such a way facilitate the method’s usability in small-scale business applications. Previous research has shown that such a method has to include procedures for determining and describing *who* in an organisation that needs *which* information in order to do *what*, as well as *when* and *where*, such information is needed.

A method for information demand analysis therefore has to include all, for the purpose, relevant aspects of enterprises, such as work tasks, organisational structures, processes, information sources and information receivers. This handbook describes exactly such a method in terms of content, structure, and use.
1.2 Purpose of the Handbook

This handbook aims at providing the reader with a background to, and an overview of, information demand analysis, as well as describing the method that has been developed with the specific purpose of facilitating such analysis. The method is therefore not only described in terms of its included parts but also in terms of practical use. As a consequence of this purpose, the content of the handbook is focusing mainly on the pragmatic aspects of information demand rather than the theoretical ones.

This handbook is intended for and directed towards three different types of readers:

- Firstly, individuals intending to use the method in order to perform information demand analysis in industrial settings.
- Secondly, individuals within enterprises to be analysed with respect to information demand, as way to prepare both the organisation and individuals within it for activities requiring their efforts.
- Thirdly and lastly, individuals with an interest to improve, adapt, or further develop the method for information demand analysis for other purposes than those presented here.

1.3 An Overview of Information Demand Analysis

Before the actual method is presented, a shorter background to what information demand as a concept is, as well as a shorter introduction to how such demand best is analysed, is needed.

1.3.1 What is Information Demand?

Information demand as a concept and as a research area is by no means something new. It has in one way or another been dealt with in such different areas as Information Retrieval (the theory behind search engines), Knowledge Management, Decision Support Systems, and Information Logistics. How individuals selects, collects, and use information have of course not only been considered within technical disciplines, these issues has also been focused on in sociology, psychology, and organisational theory. However, common for all these different approaches is that they all have a rather fragmental view on information demand, in the sense that focus only is on a few specific aspects, suitable for the perspective taken within that specific research area. In the research that constitutes the foundation for what is presented in this handbook, a holistic view on information demand has been attempted. This has mainly been done through studying literature from several different research areas, performing interviews with representatives from several different organisations and by in a number of test cases identify, model, and analyse actual information demands using several different methods and approaches. The result of these efforts is summarised in this section with the purpose of providing the reader with a background to the method for information demand analysis that is discussed in this handbook. Section 5. provides the reader with reading suggestions if more information on the topic than what is given here is needed or wanted.
Information is both here and in the research leading up to the method presented in this handbook defined according to the following:

*Information Demand is the constantly changing need for relevant, current, accurate, reliable, and integrated information to support (business) activities, whenever and where ever it is needed.*

A less formal way to define information demand is as the connection between the information that in different ways are managed by an organisation, the work task performed within that organisation for which the information is required, and the roles performing such tasks. From an analytical perspective this is considered the core of information demand and is referred to as the context in which information demand exist. In addition to this core, or information demand context, there are also several individual and organisational aspects that have to be considered in order to obtain as a complete understanding of information demand in an organisational setting as possible.

Example of such aspects that influence information demand in addition to what is defined by the information demand context are; social networks, individual’s competence, ambitions, goals, and personal resources. Information demand is furthermore also about a very specific view on information that is used and utilised within an enterprise. It is not, from a demand perspective, very relevant to consider information in terms of data, information, or knowledge but rather in terms of why certain information is needed and for what. An example of this is the differentiation of information in procedural and operational information, i.e. such information that covers *how* something should be done rather than *what* to do. The demand for such information is usually more often than not defined by role and responsibility within an organisation that it is by if the demand can be met by structured data from a database or by knowledge communicated as running text in an instruction manual. To analyse information demand is therefore in many respects an issue of analysing and understand organisational, technical, and psycho-social aspects of an enterprise.

1.3.2 The Purpose of a Method for Information Demand Analysis

A method for identifying, modelling, and analysing information demand, as it is summarised above, is a powerful tool for developing both technical and organisational solutions for demand-driven information supply. However, for such a method to be successful in its purpose other aspects than the purely information related aspects also have to be considered, e.g. the environment or context the method will be used in, the actors that will be using it, to what ends the results it produces will be used as well as how such results best are documented and communicated. The method covered in this handbook aims at providing the support necessary for analysing (parts of) organisation from an information demand perspective in accordance to the above.

Even though the method described here very well can be used for many different purposes, is the intended purpose nevertheless to identify and represent the information demand individuals within an organisation have when performing work tasks in accordance to their roles, responsibilities and positions within that organisation. This focus is central and crucial for the effective elicitation of relevant information demands without the risk of ending up analysing more traditional enterprise aspects such as process flows, value chains, business goals, and organisational structures.
A more detailed description of the purpose of, and motivation for, the method as well as a background to it from a requirement and stakeholder perspective can be found in "D1 – Information Demand Analysis Methodology: Requirements" [1] that is available from one of the project partners upon request.

1.3.3 What Information Demand Analysis Is and Is Not

It is here important to point out that the method for information demand analysis that is presented here is not intended to be yet another method for enterprise modelling or as a tool for eliciting requirements for information systems. Even though many of the aspects of enterprises that is central from an information demand perspective is the same as those focused on when modelling enterprises, focus in the method presented here is not to process or improve such aspects but rather to understand them in order to identify information demand. Hence, approaches are taken from what traditionally could be considered enterprise modelling but they are used with a different purpose. In that regard information demand analysis is more a new perspective on a well-known domain and a repackaging of existing methods, notations, and tools than anything else. Formulated differently; information demand analysis is the application and development of well-known work procedures for enterprise analysis and modelling with a new conceptual focus, aiming at understanding the demand for information individuals have when performing work-related tasks in an organisational context.

2 Example Case – Management of Academic Courses

To better and in a more comprehensible manner illustrate and explain the method and its parts, this handbook is consistently relying on an example case taken from the academic world, describing a typical situation relating to defining, planning, executing, and administrating educational courses. Figure 1. below describes the information flow within such a situation.
Figure 1. Illustration of an example case relating to the management of courses.
The model and its different parts are thoroughly described in later parts of this handbook but a shorter summary of its content is:

- **Role** – roles is the main focus in information demand analysis and is defined as the organisational abstraction of responsibilities as well as the tasks included in them. In the case such roles are Examiner, Teacher, Head of Department, Course Administrator, and Course Participant.

- **Position** – a position is the formal position or form of employment an individual has within an organisation. A position generally has a strong connection to both role and responsibility in the sense that individuals with the same position have similar roles and performs similar work tasks, even though this is not always true. In the case examples of positions are Professor, Assisting Professor, Subject Teacher, Ph.D. Student, Student, and Administrator.

- **Responsibility** – area of responsibility is the logical grouping of a number of interrelated tasks appointed to a group or and individual. Examples of this are Teaching, Research, Examination, and Thesis Supervision.

- **Task** – a (work) task is a number of coherent activities with a specific purpose, performed by a role as a part of that role’s responsibility. The case includes Course Preparation, Lecturing, Exam Preparation, and Lab Supervision.

- **Process** – a process is a sequence of tasks in a recurring flow creates a value for a recipient and that has specific requirements on competence, resources, and information. In the case examples are Give Course and Supervise Ph.D. Student.

- **Resources** – resources are from an information demand perspective instances of the various systems, tools, and entities that are being used or are required for accessing the information demanded when performing tasks. Such resources can be either organisational, i.e. be provided to an individual by the organisation, or individual, i.e. owned and managed by the individual itself. In the case examples of resources are Intranet, LADOK (a Swedish national system for managing study results in higher education), PDAs, and E-mail accounts.

- **Organisational goals** – organisational goals are the rules and expected results an organisation have for and on its various processes and tasks. Typical examples of such goals can be 85% of the students shall pass a course, 70% of the research should be externally finances, and Education of Ph.D. Students shall be performed in accordance to defined study plans. Example on a more regulative goal is; Only professors or assisting professors are allowed as examiners in a course while a Ph.D. Student only should be used for teaching activities.
• **Organisation** – the term organisation refers to a grouping of roles performing tasks in accordance to predefined goals. An organisation usually is divided into various groups and departments also constituting organisations. In the case such organisations are Jönköping University, School of Engineering, Department for Computer/Electrical Engineering, and the Research Group for Information Engineering.

• **Social Networks** – a social network is the connections an individual have to internal or external individuals and groups that can be considered relevant for a role, responsibility or task that individual have or perform within the organisation.

• **Informal Information Flow** – informal information flow refers to the information exchanged through an individual’s social networks rather than through channels defined and provided by the organisation the individual belongs to.

• **Competence** – is the knowledge about a specific area, subject, or topic that is required in order to perform a task. In the example case typical examples of competence is that the individuals that have the role of either Examiner or Subject Teacher needs knowledge about the topic on which the course is focusing. Differences in individuals’ competence will lead to differences in information demand regardless of if the role, tasks, or responsibilities are the same for the individuals.

• **Individual Goals** – these are such goal that an individual might have for a task or responsibility in addition to the ones defined by the organisation. An example of this relating to the case would be if an examiner expects that 90% of students should pass a course even though the organisation only expects 85%.

• **Location** – refers to the location on which an individual have the demand for information and might in the case be such things as Office, Lecture Room, or Meeting Room but can in other cases also be external places such as a car, the individual’s home etc.

  **Time** – is either the specific point in time or a time interval during which an information demand exists or is relevant.

  **Individual** – refers to an actual physical individual have a position and one or several roles as well as performing tasks within an organisation.
3 IDA – a Method for Information Demand Analysis

Identifying, analyse, and understand information demand from an organisational perspective is a complex task and therefore has to be broken down into several different steps that can be performed in a sequential and iterative manner depending on the prerequisites and expected results of a specific problem. The method presented here supports this by its structure. Figure 2. below provides a schematic overview of the complete analysis process while the different parts are described in more detail in their respective sections below.

An information demand analysis is always initiated by a delimitation of the area of analysis, i.e. scoping, and is concluded by the application of the results in various activities aiming at improving the current situation regarding information flow, such as software development or process improvement. The result of an information demand analyse might also be different solutions for demand-driven information supply. Figure 2. Below also describes various supporting information objects (blue rectangles), information systems (red rectangle with vertical lines), and expected results from each of the phases (white documents). The figure also depicts a number of method components (green rectangles with rounded corners) and to some extent also the activities performed within these components (pink hexagons). Dotted elements in the figure represent parts of the information demand analysis that to some extent are supported by the method but is outside the scope of this handbook.

In addition to the framework just described, the method also includes a number of central principles or value base on which the various parts of the method rests. The process illustrated above is defined with these principles in mind but it should nevertheless clearly be pointed out that the information demand context, that is considered the most central and important aspect of information demand analysis, have different requirements that the rest of the activities typically do. By following this process it becomes possible to ensure that the method identify relevant information
demand contexts rather than more traditional enterprise concepts such as processes, goals, problems etc. Furthermore, the method design allows for a relatively straightforward and swift identification of basic information demands. Demands that then can be documented and represented for use as is or as the foundation for continued analysis and refinement by the use of additional and optional method components. As a consequence of this, the phase denoted “ID-context modelling illustrated in Figure 2. Correspond to the method component ”ID-context modelling” while no such one to one mapping exist for the rest of the phases and method components.

### 3.1 Perspective – What Is Important in IDA

To rely on a method is more than just using a number of notation and tools in a predefined sequence. As a method user one also always have a purpose behind choosing and using a method and the method therefore also has to support and facilitate this purpose in order to be useful in the given situation. This means that the underlying principles on which the method’s various parts are based have to be known in order for the method user to be able to do assess the method’s suitability for the given situation.

The creators of both the IDA method and this handbook considers the understanding of information demand to mainly be about understanding the individuals that have such demands, as well as the context within which the demand exists. To model and analyse information demand is therefore also much about, together with these individuals, creating a shared view on the information flow within their organisation. As a consequence of this reasoning many of the activities performed as a part of the IDA-method relies heavily on what usually is referred to as participative modelling, i.e. the models that are produced during the analysis process is produced in cooperation with the actual stakeholders. The main motivation for this approach simply is that no one knows more about the information demand context than the individuals working within it. The method user is therefore, in many respects, also a facilitator with the task of helping a group of people to define and express their view on the context with respect to information demand.

From a practical perspective this aspect of the method means that most of the activities have to be both planned and performed collectively with individuals from the investigated organisation, something that, quite naturally, also affects the shape and form of the different activities.

Yet another important consequence of the above is the clear role focus taken in information demand analysis. As opposed to, for example, process modelling, the sequence and logic of activities are unimportant, i.e. when we analyse information demand we do not care about the order in which various activities are performed and neither are we interested in how information objects are refined by or grouped to such activities. There is many, much more suitable process modelling approaches if this is the wanted outcome. The purpose of the method described here is instead to clearly identify what information a specific role demands in order to perform a specific activity.
4 Using IDA Practically

In this section the different method parts are described in terms of content, procedures, and documentation by referring to the example case presented in Section 2.

4.1 Delimitation of Analysis Area, a.k.a. Scoping

Scoping is the process or activity of defining the area of analysis and is done with the purpose of selecting the part of an organisation to be analysed with respect to information demand, as well as to identifying the individuals that will be providing the necessary background information during the continued process of analysing. Scoping also serves the purpose of helping in the understanding and identification of the “customer’s” perceived problems, motivating it to perform an analysis of information demand in the first place, as well as identifying any intentions, goals and expectations the customer has with and on doing so.

Since scoping can be done in as many different ways and settings as there are organisations and customers, as well as individuals facilitating the scoping, the method detailed here does not provide any real methodological support in terms of method components, procedures and tools. Instead it provides general guidelines, some pointers on what to focus on and some support in terms of procedures, notation and concepts utilised in other method components that might support the method user when performing this initial step. However, it should be noted that while there might be no methodological support for performing this part of the analysis there is nevertheless a clear purposes with doing so and hence also a number of activities that need to be performed and results to be produced with respect to several requirements and expected results as described below. Any additional work with analysing information demand should not be started until this initial phase has been performed and the expected results are achieved.

In terms of the supplied example case a suitable scope, and also the chosen one, could be to analyse the information demand in relation to specific processes such as, Provide Course (as a part of a study programme) since this process involves many different roles and organisational units as well as a number of information systems. This scope was considered particularly suitable for the example case as the educational domain is relatively conformal in terms of activities, independent of which course it provides. If the focus for the analysis instead had been research, something that can vary considerably more, a better scoping might have been to focus on an organisational unit.

4.1.1 Activities

Defining the activities to be used in this phase of the analysis is not easily done due to the many possible situations in which scoping can be done but in a general sense the phase has its start in a perceived problem to which understanding information demand is a crucial part of the solution. Based on this problem the method user in cooperation with the party having the problem has to define the problematic area and the actors within it. The typical way to achieved this is in meeting form by interviewing key stakeholders within the customer’s organisation such as process/product owners, department
managers etc. but can also be done by more involved approaches such as observations, model walkthroughs etc.

### 4.1.2 Expected Results

Independently of the choice of activities to perform during the scoping, the outcome should be the following:

- A well-defined and expressed purpose with the analysis, i.e. an answer on why the analysis should be performed and what the expectations on it are.

- A well-defined and delimited focus area, understood by all involved parties in terms of expected results and time and resource requirements. This focus area might be a specific process (including the tasks performed as part of it and the roles performing such tasks), a department or a complete organisation. Key to this result is to identify the roles for which the information demand should be analysed.

- A mission statement incorporating the following:
  
  o A background to, and description of, the assignment as it is agreed upon by the customer and the method user.
  
  o A description of expected results and effects of the assignment and how such results and effects are related to the problems the customer experiences.
  
  o A list of individuals to be considered as informants during the continued activities, i.e. individuals having roles within the identified scope. Job descriptions for such roles should ideally also be attached in order to define the scope of each individual’s responsibilities.
  
  o A time plan including a number or scheduled interviews and modelling seminars, providing an estimate of the analysis expected runtime.

### 4.1.3 Support and Tools

To achieve the shared understanding necessary for the customer’s needs, situation, and organisation there are a number of supporting work procedures and tools that can be used during the scoping. Given that a large part of the quality and correctness of the result produced during this phase is completely based on the experiences and knowledge of the person performing the information demand analysis, there are a number of things worth consider in order to ensure high quality:

- **Concept graphs and definition** – utilising concept modelling might facilitate a shared understanding of concepts central to the investigated organisation. Doing so ensures that all parties have the same understanding of the topics being
discussed. A concept graph is simply a model that relates relevant concepts to each other. Support for producing such models is incorporated in most enterprise modelling methods including the Enterprise Knowledge Development (EKD) method further detailed in section 3.2.4.1. Figure 5. exemplifies a very small concept graph for parts of the method described here.

- **Enterprise modelling** – to support the various scoping activities traditional enterprise modelling approaches can be used in order to define and understand processes and organisational structures. Such constructs are provided by EKD as a part of the enterprise modelling method component but can also be provided by alternative methods such as IDEF, BPMN etc.

- **Method documentation** – communicating the purpose of, as well as the procedures for, analysing information demand might facilitate the customer’s understanding of the benefits of, and requirements for, continued activities. It is also important to continuously documenting the different activities and their results in order to facilitating the understanding of the results in a context also some time after the analysis is performed.

- **Domain knowledge and experience from previous projects** – while the method user might have experiences from previously performed analysis the customer’s representatives have a unique understanding of the problems, structures and processes relevant in the specific case. Utilising the human capital present during the scoping phase is therefore crucial.

- **Collection of Information Demand Patterns** – referring to the information demand patterns as described in the project deliverable “D3 – Information Demand Patterns” [2] during the scoping phase is a way to utilising generalised knowledge and experience that transcends that of the involved parties. Doing so might therefore not only increase the quality of the results but also shorten the time necessary for producing them by already in the scoping phase identify information demand specific problems.

### 4.2 Modelling of Information Demand Contexts

The main purpose of this, the second phase, is to identify the basic information demands based on the core concept of information demand context, i.e. which role performs what tasks and what does this require in terms of resources and information. This phase therefore clearly focus on the concepts and relationships illustrated in Figure 3. below.
The purpose of, and intention with, this focus is to as quickly and with as little effort as possible identify a foundation of basic information demand on which continued work and refinement can be based. It is also important to note that this basic understanding will be based on roles rather than processes. Consequently, traditional enterprise modelling aspects are not considered at all in this phase. The following is a detailed list of the purposes of performing such a context-modelling phase:

- Understanding the character and personality of informants as well as their roles, tasks, intentions and work situations in order to facilitate the continued analysis.
- Identify, and understand the scope of, the tasks generating information demands.
- Identify, and understand the scope of, the roles performing tasks and the interrelationship between specific tasks and roles.
- Identify the information demand for specific tasks in terms of operative and procedural information.
- Identify the information that fulfils the identified information demand.
- Identify the resources available and necessary in order to access information in accordance to the previous point.
- Identify the responsibilities of which roles are a part.

The model in the example case, presented in Figure 1., is an example of precisely such an information demand context. In accordance to the above, it defines a number of roles, tasks, resources, and information objects, as well as their interrelationships.

If considered relevant during the scoping and problem formulation additional concepts in terms of time- and location aspects of information demand can also be added in this phase. These aspects can from a methodological perspective be viewed as attributes on a specific task and the information demand connected to it as illustrated in Figure 4.
Figure 1. illustrates how this can be modelled as there is a time restriction added to the activity Report course results stating that “Exam results has to be reported 10 working days after the exam at the latest”.

Figure 4. Time and location aspects of information demand.

At this stage of the analysis no separation is being made between different individuals filling the same role as no individual aspects are considered. All individuals with the same organisational role are assumed to have the same information demands for a given task. While this in a deeper sense might be incorrect this is done in order to quickly achieve initial best-effort results that can be refined later in the process if wanted or needed.

4.2.1 Prerequisites

In order to perform a modelling of the information demand contexts present within the analysed organisation a number of prerequisites must be fulfilled:

- A delimited and clearly defined focus area must have been identified as described in Section 4.1 above.

- A number of individuals representing the different roles to be analysed as well as scheduled occasions for both interviews and seminars.

- Facilities necessary for performing interviews and modelling seminars (location, modelling material, equipment for note taking or recording etc.).
4.2.2 Activities

The context-modelling phase mainly involves two activities, modelling seminars and short individual semi-structured interviews with each of the selected individual. The interviews should be done in order to get a basic understanding of the individuals as well as their expectations, goals, problems and suitability as informants. Doing these interviews before any actual modelling facilitates the modelling seminars in the sense that the modelling facilitator then to some extent knows what to expect from different actors during the sessions. It also gives the informants the possibility to, in a relaxed situation, communicate their view on their situation with respect to information demands. The interviews of course have to be adapted for each situation depending on the unique settings in every project. However, some typical questions that could and should be asked are:

- Who are you, what position do you have and what are your responsibilities within the organisation and/or process?

- What roles do you have as a part of those responsibilities and what tasks are associated with those roles?

- What is the information demand associated with these tasks?

- What problems do you see regarding the information situation?

- What do you consider to be the strength of the current information situation?

- What are your expectations on the activities performed as a part of the analysis and how do you think it will affect your future situation?

- What, if anything, do you think should be covered during the continued activities?

The participative modelling sessions are where the actual information necessary for continued activities is collected. Such participative sessions are typically done in groups of 3-8 participants at the time. If the case requires more individuals to be investigated several modelling sessions are needed since more than 8 participants makes the sessions harder from a managerial point-of-view. It also produces models that tend to be too complex and large to gain the intended overview of the scope. In the supplied example a typical selection of roles to investigate are such roles that are involved in the selected scope, i.e. a representative for the programme committee, a department head, an examiner, a teacher, a student and representatives from the administration.

During such a modelling session the aim is to get the participants to identify the different tasks performed within the scope and how this relates to information (needed and/or used) grouped by role. Typically, this is done by writing down different tasks and information objects on pieces of paper and attaching them on large paper or plastic sheets and then connecting them to each other. The reasoning and motivation behind this approach is that it allows for easy restructuring and changes as the session progresses. An additional benefit of such a non-technical approach is that is easier to get
the participants to contribute to the emerging model than it would be if they all were seated around a table watching the model emerge on the facilitator's computer screen.

It should be noted that while the main purpose of such modelling seminars is to identify information demand context a certain degree of flexibility is needed in terms of how the seminar is facilitated. If the participants get stuck on concepts, processes and other aspects of the scope not directly related to the contexts it might be necessary to deal with these issues by changing focus and direction of the seminar until the matter is resolved. As a consequence several different models might be produced during one seminar but the main purpose should nevertheless be to generate the knowledge necessary for drawing conclusions regarding information demand. Obviously the results produced during such sessions will depend on the skill and experience of the facilitator.

Typically a well-defined notation is used for constructing models during this phase. For the construction of models during this phase and then preferably the one illustrated in Figure 1. as it includes all the necessary constructs. If Figure 3. and 4. is compared to Figure 1. one can see that the relationships expressed in the concept models also can be expressed in the described notation. Some additional points about the notation should also be considered:

- There is, in the notation, no graphical construct for expressing information demand as experience has shown that this is not how informants typically view information demand. Instead information demand is expressed by connecting an information demand as any other information object but using the relationship named Information Gap in Figure 1.

- Generally tasks should be named in verb form to illustrate the fact that it is something that is being performed. As an example of this the formulation Examine is considered better than Examination as the latter could be mistaken for the information object (the actual document handed out during an examination).

- Information objects and resources are best expressed in singular noun form. Even though it in reality can refer to several objects of the same type it is the type of information or resource that is interesting rather than the number of objects.

**4.2.3 Expected Results**

The context modelling should result in the following:

- Documented interviews (notes or recordings).

- A number of models as described above.

**4.2.4 Support and Tools**

To support the generation of the knowledge necessary for identifying information demand contexts in the next phase a number of different tools and approaches can be utilised:
• Questionnaire for interviews as described in Section 4.2.2.
• Best-practices for participative modelling.
• Modelling approach and notation, preferably conforming to the notion presented in Figure 1. and Section 4.2.2. above.
• Standardised modelling material conforming to the chosen notion.
• Collection of Information Demand Patterns – while there is no direct use for this during the activities in this phase, it can still be used as a support for the method user in order to recognize different patterns existing within the analysed environment and thereby also better facilitate the modelling activities.
• Existing enterprise knowledge represented either as various models or as data in different business systems can further support the information gathering as a complement to the modelling seminars.

4.3 Analysis and Documentation of Information Demand

Once the context related information is gathered it has to be evaluated (and if necessary clarified and refined) and represented in a format useful for continued work. In addition to refining and digitalising the models this phase also allows for comparing the resulting models to existing enterprise information, if available, as well as relating them to existing patterns. During this phase a choice has to be made whether or not the analysis should be continued and if so how in terms of what concepts to focus on and thereby also which additional method components to utilise. If the analysis at this stage is considered done with respect to its purposes the resulting models can be used as is or be represented in the Extended Enterprise Modelling Language as described in Section 4.5, depending on the intended use. Also, during this phase simple analysis of such things as information gaps (the difference between information demand and the information actually provided) or possibilities for filtering of unnecessary information can be performed.

It should however be noted that, as described in Figure 2. above, this step has to be iterated over for every additional level of analysis that is added on top on the contextual one. This is required to ensure that any new information gained during such additional analysis activities keeps its connection to the information demand contexts identified during the initial steps of the process. In that sense any additional analysis is used to further refine the information demand identified during the context modelling, i.e. if context modelling identifies the general information demand for a specific role then these additional aspects can be used to add and/or filter information to such demands.

4.3.1 Prerequisites

Since the purpose of this phase is to refine and understand the results gained during the previous phase the models resulting from that phase is needed. In order to compare and
relate the gathered information to existing enterprise knowledge such knowledge has to be available in terms of process maps, organisation charts etc. Furthermore, if patterns are to be applied a collection of suitable patterns is needed.

### 4.3.2 Activities

The first activity in this phase is to take the models produced during the modelling seminars in the previous phase and “transcribe” these into a well-defined notation with constructs for all concepts and relationships relevant for information demand contexts. An example of such a notation that can be used is presented in Figure 1. above expressing the current information demand situation for the relevant roles and their tasks in accordance to the identified example scope of Providing Course (on study programme). Worth noticing in the model illustrated in Figure 1. is the lack of structuring in accordance to processes. Even though there clearly is some sequential ordering between tasks present in the model this sequence is ignored in order to increase the focus on roles and tasks instead.

During the transcribing of the models correlations between information flow in the current case and previous cases sometimes can be identified. Such correlations are referred to as patterns and can contribute to the process in two different ways. If an identified situation within the models is considered similar to already identified and solved situations from other cases it reasonable to assume that the solutions applicable in that situation also is applicable in the current one. For this purpose a collection of patterns can be used in accordance to the directions in the project deliverable “D3 – Information Demand Patterns” [2]. If on the other hand no corresponding pattern can be found in the pattern collection despite the fact that it has been identified in a number of different cases, it is reasonable to assume that a candidate for a new and valid pattern has been identified. How to deal with this situation is detailed in the project deliverable “D6 – Method for Elaboration Information Demand Patterns (Handbook)” [3].

During these activities the method user has a certain degree of freedom to restructure and change the results from the previous phase if deemed necessary. The reasons for doing so might be obvious mistakes and faults in the original models, additional knowledge gained by comparing the original models to existing documentation or by applying information demand patterns to the current scope. However, not only should the motivation behind doing so be clear, any changes should also be communicated and explained to the customer at some point. This is preferably done by means of a model walkthrough with the relevant representatives from the customer.

### 4.3.3 Expected Results

The context modelling should result in the following:

- Information Demand Context models approved by the customer.

- Additional models (such as Enterprise Models, Competence Maps etc.) approved by the customer (if additional analysis steps have been performed).
4.3.4 Support and Tools

- Modelling software of choice with support for the notation to be used.
- Collection of Information Demand Patterns and methods for pattern identification and matching.

4.4 Analysis of Related Enterprise Aspects

While the modelling and evaluation of information demand contexts is considered to be crucial when performing information demand analysis there might be other aspects of information demand equally relevant to consider depending on the purpose of the analysis. With that intention the method described here incorporates a number of method components focusing on such additional aspects that can be utilised when needed or wanted.

In terms of the supplied example case it might be relevant to consider many additional aspects such as the process of Provide Course, the individuals having the different responsibilities and positions (Professors, Ph. D. students, Administrators etc.) and their different competences. Furthermore there might be a need for considering the different social networks such individuals have and utilise as this might affect such things as guest lectures in the course to be given etc.

The method components are based on existing methods considered well suited for their respective intended purposes and should be considered as suggestions on how certain aspects of information demand analysis can be performed. If it for some reason is considered beneficial to utilise other methods, the method user is free to do so as long as focus is kept on the relevant concepts.

The following subsections will describe each method component in general terms, i.e. its conceptual focus and overall purpose. For details on how to work with the actual methods described refer to the relevant documentation.

4.4.1 Enterprise Modelling

Once any information demand contexts is identified it might, depending on the situation, be relevant to connect such contexts to their organisational setting, i.e. understand how roles and tasks relates to larger processes, organisational structures, employment positions etc. There exist many methods for doing so but one in particular provides not only a complete set of constructs for analysing all concepts relevant for information demand but also fits well into the participative nature of the IDA-method. Enterprise Knowledge Development (EKD) is a method that when developed focused on generating knowledge about organisations in order to understand enterprise functioning, requirements and reasons for change. EKD is based on a set of description techniques for describing aspects of enterprises, stakeholder participation, a set of guidelines for working and a set of software tools with which the following can be produced:
- **Goals Models** – motivates why tasks are performed and why the organisation is structured in a specific manner. From an information demand perspective these models can be used as a tool for understanding both organisational goals but also individual goals.

- **Business Rules Models** – can provide additional insight into timing aspects of information demand.

- **Business Process Models** – not only can such process models be used as a tool for modelling processes from an information demand perspective but they can also be used for scoping purposes when selecting the parts of an organisation to analyse with respect to information demand.

- **Actors and Resource Models** – even though the context modelling component is the main methodological part for understanding the relationship between roles and resources when performing the initial analysis of information demand this part of EKD can be used to analyse an model the individual aspects of resources and connecting individuals to tasks, positions and in a later stage also to competence.

- **Technical Component and Requirements Models** – no relevance for IDA.

EKD also defines a concept graph detailing the concepts and their interrelationships present within the EKD-domain as illustrated in Figure 6. below. Relating this graph to the ones representing information demand in Figure 3, 4, and 7. it is clear that EKD conceptual constructs correlates well to selected parts of information demand. Further details on EKD, its constructs and how to work with it can be found in the EKD User Guide [4].

![Figure 6. Relationship between models in EKD.](image-url)
When utilising EKD or any other enterprise modelling oriented method focus should be put on the concepts and interrelationships illustrated in Figure 7. This figure also illustrates how these concepts relate to the information demand contexts.

Figure 7. Conceptual focus for enterprise modelling.

### 4.4.2 Analysis of Social Networks

Another aspect of information demand that depending on the situations needs, can be added to initial analysis is the analysis of social networks and informal information flow influencing individual’s demand for information as well as the manner in which it is fulfilled. For doing so IDA relies on an existing method for performing social network analysis named I-star (i*). Similar to EKD i* introduce a number of constructs as well as procedures used to analyse and model social networks with respect to actors, goals, tasks and. In terms of the supplied example case it could be relevant to consider the social networks of the individuals involved in the case as these networks can contribute to such aspects of Provide Course as the possibilities for having visiting guest lectures or gaining unique competence within the course subject increasing the quality of the course.

Even though i* covers many additional aspects of social network analysis not directly related to the purposes intended here but nevertheless corresponds well to the concepts central to information demand analysis. Utilising i* is done in the same participative way as EKD and context modelling. The different constructs present within i* is covered in the iStar QuickGuide [5].
4.4.3 Competence Modelling

The final part of information demand not yet covered is individual competence. Up to the point of applying and using components all individuals analysed is considered equal with respect to their pre-existing knowledge and experiences. This is obviously not the case and consequently different individuals will on some level have different information demand for the same task. In relation to the example case this can be shown by the fact that (as illustrated in Figure 1.) the examiner is given a course subject for which he/she is to prepare a course. In order to prepare a course the examiner then either has to define or find reference information on the subject to incorporate into the course. Naturally the need for such reference information will depend on the examiners pre-existing competence (and experience) within the subject.

To better understand these differences through the modelling of competence, IDA relies on a language named Unified Enterprise Competence Modelling Language (UECML) and incorporates parts of it as a method component for competence modelling. UECML has its background in an extension of the Unified Enterprise Modelling Language that in turn is an effort in unifying the many different approaches to enterprise modelling by defining a standard meta-model. Consequently, UEML and therefore also UECML focus on many of the same concepts present within information demand analysis. Figure 9. below illustrates the core constructs of UECML. In comparison with the conceptual focus for the competence related parts of IDA presented in Figure 10. below the correspondences are clear. It should however be noted that since IDA has a clear focus on roles and individuals competence is considered only from an individual perspective, not a collective one.
As UECML is not a method in itself but rather a language and a notation for modelling competence it does not provide any guidance or procedures for working with it. However, from an IDA point-of-view the same participative approach to collecting information about competence as used when modelling contexts or enterprise aspects
can be used. Further details on UECML and its different constructs can be found in G. Péplot et. al. [6].

4.5 Representation of Information Demand

An important part of any method is how to represent the results it produces. While a number of different notations are used in the method components the method defines these are viewed more as working tools used to gain the initial knowledge necessary to understand the information demand. Once the different components are applied the results can if beneficial or needed be gathered, compiled and represented in a unified way. For these purposes a subset of the Extended Enterprise Modelling Language (EEML) has been adapted for use with IDA. EEML not only allows for all constructs of IDA to be represented but also provides a clearly defined meta-model as well as a textual representation fulfilling the requirements defined for the end result of IDA in terms of communicability and machine-readability. Since both information demand and the method presented here have a clear role focus so too will the resulting EEML models.

EEML is divided into four different sub-languages well linked together:

- Process modelling
- Data modelling
- Resource modelling
- Goal modelling

These four sub-languages in turn provide the necessary constructs to provide many of the aspects of information demand discussed in this handbook. However, it should be noted here that the purpose of representing information demand in EEML-models is not to represent all the information gained during the different modelling efforts but rather to represent the knowledge about information demand gained during them. Consequently not everything present in the different models discussed above will be present in the EEML-models. Furthermore, at this stage in the process it is no longer relevant to distinguish between information provided to the individual and information demands not fulfilled since the purpose of these models is to capture all information needed for a specific task, i.e. the ideal situation from an information perspective. Figure 11. below illustrates the EEML constructs relevant for IDA.
As the individual method components discussed so far produces models and documents expressed in different notations the purpose of this phase is to collect and combine the results from any such components used, into a unified, coherent representation that can be used to communicate the information demands as well as utilise them in various activities aimed at improving information demand. This part of the process is a continuous, iterative one that can be done as soon as some part of an organisation has been analysed, in the end of several analysis steps or not at all depending on the purposes one have with performing IDA.

To exemplify the use of EEML-models for representing information demand such a model for the role examiner is presented in Figure 12. below. When compared with the information demand context model in Figure 1. all tasks as well as information objects can be identified as present. Furthermore, the typical sequence of the different task has also been added, something that is not present in the original model. This illustrates the incorporation of traditional enterprise aspects in conjunction with information demand into EEML-models. The model in Figure 12. represents all information demands role-based (in this case for the Examiner role) for the current scope but can also be further broken down for each task. Depending on the tool used for generating the models each task can be represented either as sub-models or as separate models, each with its specific set of information demands and sub-tasks.
Figure 12. Part of the example case represented in EEML.
4.5.1 Prerequisites

In order to collect and unify the results from previous phases any such results must be available and verified as correct with respect to the different stakeholders involved in the analysis.

4.5.2 Activities

This phase only contains a single but rather time consuming activity, that of transforming existing models into EEML-models.

4.5.3 Expected Results

A number of role-focused EEML-models expressing information demand.

4.5.4 Support and Tools

While it is quite possible to produce EEML-models in any modelling tool the process is greatly simplified by using a modelling tool that has support for the EEML meta-model and supports expandable views on model such as Computas’ Metis or Sparx Systems’ Enterprise Architect. However, there exist simplified versions also for tools such as Microsoft Visio and OmniGroup’s OmniGraffle.

5 Reading Suggestions

In this section reading suggestions for topics relevant to the material presented in this handbook is given.

For further information on information demand and –use within small-scale business contexts:


For further information on requirements on a method for information demand analysis:


For further information on practical application in, and experiences from, information demand analysis in a number of industrial cases:


Magnus Lundqvist, Eva Holmquist, Kurt Sandkuhl, Ulf Seigerroth, Jan

For further information on theoretical and industrial evaluation of IDA, a method for information demand analysis:


For further information on information demand patterns:


**References**


