Proof for re-accreditation of

The Netherlands Research School for Information and Knowledge Systems SIKS

Report for the peer review committee

30 April 2008

Preface

SIKS is the Netherlands Research School for Information and Knowledge Systems. It was founded in 1996 by researchers in the field and then accredited in 1998 by the KNAW, the Royal Netherlands Academy of Sciences. The SIKS national Research School was subsequently re-accredited by the KNAW for the period 2003-2008. The present report, produced by the SIKS Research School members, has been written for the international peer review committee visiting SIKS on 02 and 03 June 2008 in Amsterdam, as a baseline for re-accreditation by KNAW for the period 2009-2015. It describes and analyzes the SIKS activities over the current accreditation period 2003-2008, and it discusses the SIKS plans and outlook for the coming period 2009-2015.

On behalf of SIKS:

Prof.dr. Roel Wieringa, Scientific Director of SIKS
Prof.dr. Hans Akkermans, Chair of the SIKS Board of Governors

Amsterdam/Enschede/Utrecht,
30 April 2008

Contents

1. Introduction

SIKS is the Netherlands Research School for Information and Knowledge Systems. It was founded in 1996 by researchers in the field of Artificial Intelligence, Databases & Information Systems, and Software Engineering. SIKS's main concern is to provide a nation-wide, first-rate research environment and associated PhD education in information and computing sciences, specifically in the field of Information and Knowledge Systems (IKS).

SIKS is an inter-university Research School that brings together the IKS research groups from most Dutch universities, specifically:

- VU University Amsterdam (VUA);
- Utrecht University (UU);
- University Twente (UT);
- University of Amsterdam (UvA);
- University Maastricht (UM);
- Technical University Delft (TUD);
- Eindhoven University of Technology (TU/e);
- Radboud University Nijmegen (RUN);
- University of Tilburg (UvT);
- Open University of the Netherlands (OU);
- Centre for Mathematics and Computer Science (CWI).

Currently over 400 researchers are active in SIKS, including nearly 200 PhD students. The Vrije Universiteit Amsterdam (VUA) is the SIKS administrative university legally responsible for its well-functioning. The management office of SIKS is located at Utrecht University (UU).

SIKS received its first accreditation by KNAW (the Netherlands Royal Academy of Sciences) in 1998 for a period of five years. In 2003 the School was re-accredited for a period of six years. The first Scientific Director of SIKS was Prof.dr. John-Jules Meyer, Chair of Intelligent Systems at Utrecht University; he held the position from the start of SIKS until 31 December 2005. As of 01 January 2006 Prof.dr. Roel Wieringa, holding the Chair of Information Systems at the University Twente, was appointed by the SIKS Board of Governors as Scientific Director of SIKS.

Table 1 gives a concise summary of some key performance indicators of SIKS, of a decade spanning the SIKS Research School activities from its start in 1998 to the present year 2008, which finalises its second period of accreditation by KNAW.

SIKS performance indicators	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
# PhD students in the SIKS NL School	35	57	63	88	102	112	133	161	192	200	200*
# SIKS Research fellows	69	72	83	129	138	158	170	185	195	203	210*
# SIKS PhD theses delivered	5	8	11	11	17	18	20	21	28	25	30*
Number of SIKS organised events	6	8	17	21	24	27	26	26	24	39	40*
Number of SIKS organised days	12	14	17	33	39	43	65	63	59	85	90*

Table 1: Some of the SIKS performance indicators 1998-2008 **estimated*

When SIKS received its first KNAW accreditation in 1998, about 35 PhD students and 70 research fellows were active in the School. Financial resources were very limited.

In the first accreditation period (1998-2002), SIKS therefore took efforts to expand. As a result many researchers and research groups decided to join the School. Even more important, SIKS senior researchers became increasingly successful in attracting young researchers to step into a four year PhD track. As a result of these efforts, the SIKS population doubled in a period of three years and the number of PhD students nearly tripled in that period.

As Table 1 shows, SIKS has succeeded to continue its expansion during the second accreditation period (2003-2008). In parallel, SIKS has broadened and increased the excellence of its national education program for PhD students, drawing upon the resources available from its growing number of senior researchers in the Netherlands. (For further data, see Appendix A for an overview of the SIKS research and education activities; Appendix B for an analysis of the funding sources of SIKS PhD students; Appendix C for a list of key publications of SIKS research groups; and Appendix D for the full list of successful PhDs that SIKS has delivered to date).

All groups of SIKS are actively involved in the educational program for SIKS PhD students. In 2007 SIKS (co-)organised 39 activities, totalling 85 days of educational activity, and varying from basic courses and tutorials to advanced courses, research seminars, workshops and master classes, given by visiting professors from abroad or senior staff members of the School. Hence, roughly speaking, we have succeeded in doubling the SIKS activities, comparing the beginning of the current KNAW accreditation period (2003) with the final year (2008) discussed in this self-study report.

The SIKS activities agenda is updated weekly and can be found at www.siks.nl. In 2007 SIKS has decided to further expand the advanced components stage of its educational program in the next accreditation period (see further Chapter 4).

The SIKS accreditation report for 2003-2008 presented a research program that distinguished eight research foci that cut across the research themes of the participating groups in SIKS. An evaluation in 2007 carried out by SIKS revealed that most of these foci have been adequate and stable, but some needed to be updated to reflect new developments in the field. As a result, we have identified seven research foci for the next six years 2009-2015 (see further Chapter 3).

In 2006 the Board of Governors of SIKS decided to apply for re-accreditation by KNAW for the period 2009-20015. To obtain this accreditation it is mandatory for a Research School to evaluate its research and educational programs and have these programs assessed by an international peer review committee. The aim of this report is to present a concise overview of current activities of SIKS, to indicate the steps in the re-accreditation process we carried out so far (*viz.*, past performance and future plans), and to provide the peer review committee with adequate information to prepare for its evaluation visit, scheduled on 02 and 03 June 2008 at Amsterdam.

This document is organised as follows:

- In Chapter 2 we describe the scientific mission, structure and research environment of SIKS.
- In Chapter 3 we describe the research program of SIKS in the period 2003-2008 and its update in terms of seven research foci for the next six years 2009-2015, and we discuss the results of PhD research and supervision within SIKS over the past period.
- In Chapter 4 we evaluate the educational program of the past six years, and discuss the main modifications in the program for the next period.
- In Chapter 5 we indicate how SIKS facilitates and stimulates cooperation and communication between researchers in the IKS field, internally and externally. Some special attention is paid to the relations with our alumni, the relations with the international scientific community, and the relations with industrial partners in the Netherlands.
- Chapter 6 presents the organisational structure and the financial situation of the School.
- In Chapter 7 we draw general conclusions regarding the current and future situation of SIKS.

The Appendices give further facts and figures on SIKS, as follows:

- In Appendix A we give an overview of all PhD education and research activities organised by SIKS in the period 2003-2008.
- Appendix B gives an analysis of the current funding sources of SIKS PhD students, showing that most of them are acquired from a variety of external financial sources.
- Appendix C provides a list of key publications of SIKS research groups, giving a clear indication of how Dutch research in Information and Knowledge Systems contributes to the international scientific community.
- Finally, Appendix D lists all successful PhDs that SIKS has delivered to date.

2. Scientific mission, structure, and research environment of SIKS

2.1 Scientific mission

The mission statement of SIKS is:

- to organise a high-quality PhD educational program for our PhD students, employed at the Universities in the Netherlands or at leading companies in information and communication technology (ICT), specifically in the field of Information and Knowledge Systems (IKS);
- to perform high-level fundamental and applied research in the field of information and computing science, specifically in the field of Information and Knowledge Systems;
- to facilitate and stimulate cooperation and communication between our members (PhD students, research fellows, senior research fellows and associated members) and stakeholders interested in our research, such as other academic bodies or groups, leading companies in business and industry, research funding bodies, and governmental organisations.

The School currently concentrates on seven highly relevant focus areas in the IKS field: Agent Technology, Computational Intelligence, Knowledge Representation and Reasoning, Web-based Information Systems, Enterprise Information Systems, Human Computer Interaction, and Data Management, Storage and Retrieval. In Section 3.2 these research foci are described in more detail. The research foci were not established top-down by SIKS, but were developed *bottom-up*, after intensive consultation of our members (cf. Section 3.1). As a result, the research foci strongly reflect the research interests, activities, and competencies of the SIKS School population as a whole.

2.2 Structure

SIKS is, in actual fact, a self-organised and self-financed network of IKS researchers in the Netherlands. The SIKS performance indicators 1998-2008 point to (in line with the KNAW accreditation criteria) a clear need and tendency for an organised endeavour of the academic field, in the present case of IKS.

We note that SIKS definitely has an impact on the IKS research field, but does not have administrative authority over the research conducted by its over 400 researchers. Research in the Netherlands is organised and funded per university. However, as a KNAW-accredited network organisation, SIKS influences research policy in the Netherlands, it provides a platform for communication and mutual coordination of Dutch research groups, and it offers a national teaching programme for PhD students. It is the ambition of SIKS to provide the organisation and facilitate exchange among research groups in order to promote coherence and quality of research and education across the country, positioned within the inherently international setting of the field of Information and Knowledge Systems.

Thus, we maintain strict admission criteria for our senior staff. To become a senior research fellow, the School requires that each candidate works within the SIKS mission and the research areas mentioned above, has at least two years of experience in academic research after obtaining his/her PhD, and at least five high-quality, refereed publications in international journals or proceedings of international conferences over a period of the last five years. All applications are assessed by the scientific director of SIKS, and when proven to be in full accordance with these requirements, the candidate is appointed by the Board of Governors. As a result, only researchers with a solid academic background and proven competence in one or more of the SIKS focus areas can become a senior reseach fellow.

Secondly, the nation-wide participation of IKS researchers in SIKS and the gradually increasing budget (notably, most of it directly coming from the SIKS members themselves) do enable the

School to further professionalise its organisation and to (co-)organise and (co-)finance more and better educational and scientific activities on a national scale.

Thus, the SIKS ambition is to be a valuable instrument in the research and education process of PhD students and to be a binding and networking tool for the cooperation of Dutch researchers in the area of IKS, providing them with a shared research environment and a platform that they would not have had without the School.

2.3. Research environment

Since the 1990's, computing science research in the Netherlands has been concentrated into three federative Research Schools, all accredited by KNAW:

- ASCI: computer systems and image systems;
- IPA: the science of programming and algorithms;
- SIKS: Information and Knowledge Systems (www.siks.nl).

The Research School SIKS concerns the study of Information and Knowledge Systems (IKS) from the perspective of the following scientific areas:

- Database systems, as studied in computing science;
- Information systems, as viewed from their (often interdisciplinary) areas of application;
- Knowledge engineering, as studied in artificial intelligence and its applications;
- Software engineering, as applied to IKS;
- Theoretical computer science and applied logic, as a foundation to IKS.

SIKS was jointly founded by several well-known research groups in the Netherlands working in databases and information systems, artificial intelligence, and software engineering. In the past years, SIKS has expanded with a number of research groups, some of which existed before, some of which were newly established, and some of which were reallocated to faculties or departments of computing science. Because the existing SIKS groups expanded as well, the SIKS population more than tripled in a period of less than 10 years. By carefully monitoring new research interests of new groups and their projects it was (re-)confirmed on several occasions that SIKS is concerned with the three "founding" disciplines Artificial Intelligence, Databases and Information Systems, and Software Engineering. SIKS is therefore associated with an internationally identifiable field of research, scientific communities, international journals, and conferences.

Although the researchers in SIKS come from different backgrounds, they have an interest in the same kinds of research questions and problems, particularly the following:

- How should "reality" be modelled such that the resulting description can be computationally realised by means of IKS?
- What is needed to support a certain domain of application by means of IKS?
- How can information be communicated *effectively* in environments inhabited by both IKS and human beings? In particular, how can the interaction between humans and systems be realised and improved?

In Chapter 3 we elaborate how these central questions have resulted in seven research foci for the research in SIKS.

3. The research program of SIKS

3.1 Research foci 2003-2008

The research foci for the current accreditation period 2003-2008 were established by a bottom-up procedure and discussion with all members of the School, as follows. First, an extensive survey amongst all researchers participating in SIKS was carried out, as a result of which a number of potential research foci were identified. This was done by means of an electronic questionnaire which reached the highly satisfactory response rate of 95%. Next, these candidate foci were discussed in an intensive one-day workshop on 28 February 2002 with all senior researchers of SIKS. In this meeting it was decided which of these were promoted to the research foci for the period 2003-2008. The workshop resulted in a final list of eight foci, the description for each of which was finalised by 2-4 experts after the workshop. Most notably the attention for applications had increased, while still the interest in fundamental issues was maintained. The SIKS research foci emerging from this discussion within the School were: (i) Agent Technology; (ii) Computational Intelligence; (iii) Knowledge Representation and Reasoning; (iv) Web-based Information Systems; (v) e-Business Systems; (vi) Human-Computer Interaction; (vii) Data Management, Storage and Retrieval; and (viii) Architecture-driven System Development.

3.2 Research foci for the period 2009-2015

Having monitored the new projects and research interests of the newly appointed researchers in the period 2003-2008, it was decided after a number of meetings of the Board of Governors and of the Scientific Advisory Committee of SIKS to make a number of changes for the period 2009-2015:

- The overall structure of the program has been somewhat simplified. In 2003, an orthogonal structure was adopted of five “long term” research interests and eight “short term” research foci (the latter listed above). Such a matrix-like structure turned out to be unduly complex and lacking sufficient added value for doing our research and organising our educational activities. Instead, experience has shown that all activities of SIKS are in fact linked to the research foci as they are listed above. Also, all members of the Scientific Advisory Committee are focus directors. So, the above-mentioned research foci turned out to constitute the real taxonomy representative of the research in SIKS, so they provide the baseline for 2009-2015.
- Furthermore, for the coming years, it appeared that these research foci needed only a slight update: it was decided to integrate the “old” foci e-Business Systems and Architecture-driven System Development (listed above as (v) and (viii) respectively) into a single “new” research focus named “*Enterprise Information Systems*”.

Accordingly, SIKS will organise its research and educational program in the upcoming accreditation period 2009-2015 around seven research foci, namely:

1. Agent Technology (focus director: Prof.dr. J.-J.Ch. Meyer, UU);
2. Computational Intelligence (focus director: Prof.dr. E.O. Postma, UM);
3. Knowledge Representation and Reasoning (focus director: Prof.dr. F. van Harmelen, VUA);
4. Web-based Information Systems (focus director: Prof.dr. G.-J. Houben, TUD);
5. Enterprise Information Systems (focus director: Dr. H. Weigand, UvT);
6. Human Computer Interaction (focus director: Prof.dr. G. van der Veer, VUA/OU);
7. Data Management, Storage and Retrieval (focus director: Dr. D. Hiemstra, UT).

Below, we discuss each of these SIKS research foci in some more detail.

3.2.1. Agent technology

Scope

Agents are software (or hardware) entities that display a certain degree of autonomy while operating in a dynamic, distributed environment (possibly inhabited by other agents). Agents

possess properties like reactiveness, pro-activeness and social behaviour, often thought of as being brought about by mental or cognitive attitudes involving knowledge, beliefs, desires, goals, intentions, emotions, etc. As such there is a relation with cognitive modelling in psychology. Agents are capable of interacting with their environment and communicating with other agents. The area of agent technology covers the foundations as well as the design, implementation, and application of intelligent agents, both stand-alone and within the context of multi-agent systems, in very diverse domains. Agent theories and in particular agent logics provide the formal foundations for agent technology and a basis for the specification and verification of agent applications. Distributed and parallel systems research provides the more technological foundation for agent architectures and programming languages.

Research themes
Important topics of research are: synchronisation, communication, shared memory, co-ordination, negotiation, distributed reasoning/problem solving and task execution (e.g. distributed/cooperative planning and resource allocation), and electronic institutions enforcing norms on the agents in an (open) MAS. Also the methodology of constructing agent programs and systems is an important topic of research. Applications of agent technology are numerous, and range from intelligent personal assistants in various environments to cognitive robots and trading agents in e-commerce settings. In particular the following topics are addressed within the School:
- agent theories and logics
- agent-oriented programming including agent verification
- multi-agent systems (MAS), distributed and parallel systems
- agent communication, co-ordination, planning and negotiation
- normative systems, electronic institutions
- applications of agent-based systems, such as e-commerce, cognitive robotics, virtual characters in video games, companion robots.

SIKS research leaders active in “Agent Technology”:
-Prof.dr. F. Brazier (VUA)
-Prof.dr. C. Jonker (TUD)
-Prof.dr. J.-J.Ch. Meyer (UU)
-Prof.dr. J. Treur (VUA)
-Prof.dr. C. Witteveen (TUD)

3.2.2. Computational Intelligence

Scope
Traditional AI research is strongly oriented toward symbolic representations (and reasoning) in a top-down manner. The structure of a problem or environment is analysed beforehand and the construction of an intelligent system is based upon this model.
Roughly, Computational Intelligence comprises a number of techniques and methods that share the property of being non-symbolic (or rather sub-symbolic) and operate in a bottom-up fashion, where structure usually emerges from an unordered starting point, rather than being imposed from above.

Research themes
In particular the following topics are addressed within the School:
-machine learning
-neural and evolutionary computing
-datamining / intelligent data analysis
-adaptive / self-organising / fuzzy systems
-quantitative / statistical empirical research
-probabilistic reasoning / Bayesian networks
-pattern and image recognition

-intelligent search algorithms / games

SIKS research leaders active in "Computational Intelligence":
-Prof.dr. P. Adriaans (UvA)
-Prof.dr. A.E. Eiben (VUA)
-Prof.dr. L. van der Gaag (UU)
-Prof.dr. H.J. van den Herik (UM)
-Prof.dr. A. Nijholt (UT)
-Prof.dr. H. La Poutré (CWI)
-Prof.dr. E.O. Postma (UM)
-Prof.dr. A. Siebes (UU)

3.2.3. Knowledge Representation & Reasoning

Scope
This focus covers the foundational area within Artificial Intelligence that studies fundamental and theoretical properties of methods for symbolically representing and manipulating knowledge. This field is firmly placed in the symbolic branch of AI, and typically uses formal logic (in the broad sense of the term "logic") as its guiding paradigm.
Besides "logic for representation", the second major ingredient is the study of theory and implementation of systems for reasoning, i.e., the use of computation for manipulating the logical symbols to derive new information. Thus, knowledge representation and reasoning is both concerned with what inferences are sanctioned, and with what inferences can be efficiently made.

Research themes
In particular the following topics are addressed within the School:
- *Reasoning:*

- deduction, abduction and induction
- automated reasoning
- reasoning with uncertainty, approximate reasoning, common-sense reasoning
- diagnostic reasoning
- planning
- complexity of reasoning

- *Logic and representation:*

- logics for artificial intelligence, modal logics, non-monotonic logic, fuzzy logic, epistemic logic, description logic, representation of belief, intention, time, space, action, events, emotions
- belief/theory revision
- knowledge representation for databases, updates in databases
- ontologies, shared and distributed knowledge, conceptual modelling
- knowledge and concept structures for the web, semantic web

SIKS research leaders active in "Knowledge Representation and Reasoning":
-Prof.dr. T. van Engers (UvA)
-Prof.dr. F.A.H. van Harmelen (VUA)
-Prof.dr. J.-J.Ch. Meyer (UU)
-Prof.dr. A.Th. Schreiber (VUA)
-Prof.dr. B.J. Wielinga (UvA)

3.2.4. Web-based Information Systems

Scope
This research focus covers the broad terrain of retrieval and presentation of semi-structured document-centric information on the World Wide Web. In essence, stored information is retrieved

and presented to a user. A defining feature is that the information is primarily intended for human, rather than machine, consumption. The work investigates methodologies and techniques for selecting and manipulating the information, rather than concentrating on implementation details of the underlying software. We assume that document (fragments) are stored and are available for processing. The core of the work is on filtering and retrieving relevant documents, with emphasis on methods for specifying and increasing relevancy and topic coverage, and on presenting these to a user. Presentation includes synthesising relevant fragments into a coherent document that conveys the intended semantics to the user. Delivery media include computer-based presentation methods such as hypertext, multimedia and hypermedia.

Research themes
Web-oriented retrieval includes text-based techniques as well as more recent image, and other media-specific, techniques. Text-based (symbolic) techniques include carrying out static analyses of collections and creating indices based on discriminating terms. Other media-based techniques (data-based, e.g. intensity) require first an analysis of the raw data before more symbolic oriented techniques (e.g. shapes) can be applied to find desired objects. More recently, attention has been given to semantic-based techniques, where human-meaningful labels are assigned to parts of the raw data. For example, the annotation of images in an image collection or the archival of television broadcasts. The annotations can then be used to improve the retrieval process.

Presenting the information includes any processing required on the retrieved information to make it suitable for display to the end-user. For example, selecting an HTML document for display on a Web browser is a simple example. A slightly more complex scenario is the display of an XML document (which contains no default presentation information) with the use of style sheet processing by the browser. Yet more complex processing could be carried out by transforming stored textual information to synthesised voice for "display" on a mobile phone.
Presentation of information can be more complex, and include the use of interactive information, such as hypertext, or time-based information, such as multimedia. Document transformation techniques as detailed above can also be applied to more complex document types.
A further step of abstraction away from the final presentation (where XML can be seen as an abstraction step away from XHTML) is to retrieve semantic-based information. The information represented by the semantics then has to be conveyed to the user somehow, e.g. a visualisation of the graph structure of the underlying relationships, or as document fragments incorporated into a (hyper/multi-media) document. Relevant technologies include: Web document languages (XHTML, SMIL, SVG, MathML), Web document transformation languages (XSLT, XSL), Semantic Web languages (RDF, RDFS, DAML+OIL, OWL), tools and applications.

In particular the following topics are addressed within the School:
-semi-structured data
-hypertext and hypermedia
-multimedia
-the semantic web
-information retrieval on the Web
-web document (transformation) languages

SIKS research leaders active in “Web–based Information Systems”:
-Prof.dr. P. de Bra (TU/e)
-Prof.dr. J. van den Berg (UU)
-Prof.dr. L. Hardman (CWI/TU/e)
-Prof.dr. F.A.H. van Harmelen (VUA)
-Prof.dr. G.-J. Houben (TUD)
-Prof.dr. M. de Rijke (UvA)
-Prof.dr. A.Th. Schreiber (VUA)
-Prof.dr. P. Sloep (OU)
-Prof.dr. Th. van der Weide (RUN)

3.2.5. Enterprise Information Systems

Scope
Enterprise Information Systems (EIS) are systems that provide automated support for business processes in complex organisations. Organisations can be commercial or non-commercial, e.g. government, healthcare, NGOs, or communities of practice. EIS are used inside the organisation but can also be interorganisational, supporting for instance (e-)business collaborations or virtual networks. To be effective, EIS require an optimal alignment of the business system and the information system based on architecture-driven design.

Research themes
EIS research can be both design-oriented and empirical, and flourishes by a combination of both. By its nature, there is a tight connection with other disciplines, such as organisation theory and management science.
Research topics addressed in SIKS include:
- e-business
- services science
- business process management
- ICT-enabled innovation
- method engineering
- architectures (description languages, design, validation)
- modelling of organisations, communication and coordination mechanisms
- IT governance

SIKS research leaders active in "Enterprise Information Systems":
-Prof.dr. W. van der Aalst (TU/e)
-Prof.dr. J.M. Akkermans (VUA)
-Prof.dr. S. Brinkkemper (UU)
-Prof.dr. J. Dietz (TUD)
-Prof.dr. K. van Hee (TU/e)
-Prof.dr. M. Papazoglou (UvT)
-Prof.dr. E. Proper (RUN)
-Prof.dr. R.J. Wieringa (UT)
-Dr. H. Weigand (UvT)

3.2.6. Human-Computer Interaction (HCI)

Scope
Interactive Systems (IS) are systems where humans communicate and cooperate with, and through, information technology (IT). Designing IS means designing communication and cooperation technology. Designing IS requires a design approach that is based on understanding human information processing, human communication and cooperation and distributed cognition, human experience while working with technology, and the art and craft of designing the interface between human users and IT, the user interface (UI). The design of the UI has to be based on understanding the human needs, tasks, emotions, the culture of technology use, and the situation of application of the IS. In fact the result of the design of the UI can be understood as a set of requirements for the IT part of the IS. From the point of view of the users and their situation, this set of requirements is all that matters, and apart from this they do not care "what is inside". For the human users and their situation, the UI *is* the IT system.

The science of designing the IS requires a basis in:
-humanities (human information processing, human emotion, organisational psychology, distributed cognition, anthropology and ethnography);
-interaction design (artistic design knowledge and crafts at many modalities: sound, graphics, animation, theatre);
-IT (software engineering, multimedia technology, web technology, information architecture);
-hardware design (industrial and artistic design in relation to the UI);
-usability engineering (the science of HCI, cognitive ergonomics, UI design, task analysis and task design, knowledge management and knowledge engineering).

Research themes
Research in the domain of HCI requires a strong multidisciplinary basis and a view on the integration of concepts, methods, and techniques from these basic sciences.
In particular the following topics are addressed within the School:
- Relation between UI design and Requirements Engineering
- Mental models and distributed knowledge in IS
- Modelling of verbal and non-verbal interaction
- Virtual reality and multi-agent systems in the UI
- Embodied conversational agents
- The notion of "experience" as a goal for the client of design, as well as an aspect of technology use in context
- Role of externalisation (e.g. visualisation) of information during interaction
- Enhancement in usability of mobile devices

SIKS research leaders active in Human-Computer Interaction
-Prof.dr. F. de Jong (UT)
-Prof.dr. C. Jonker (TUD)
-Prof.dr. A. Nijholt (UT)
-Dr. H. van Oostendorp (UU)
-Prof.dr. G. van der Veer (VUA/OU)
-Prof.dr. B.J. Wielinga (UvA)

3.2.7 Data Management, Storage and Retrieval

Scope
The scope of the SIKS research focus *Data Management, Storage and Retrieval* is the theory and the application of computers to the management of information, including the aspects of data acquisition, organisation, storage, querying and retrieval, security and privacy, ranging from highly structured databases to unstructured natural language texts.

Research themes
The research focus *Data Management, Storage and Retrieval* is shaped by two major success stories in Computer Science: 1) the development of relational database systems in the 1970's and 1980's mainly influenced by office automation and enterprise information systems, and 2) the development of large scale information retrieval systems at the end of the 1990's, influenced by the development of the world wide web. (Accordingly, there are clear links with the SIKS research focus "Web-based Information Systems" here). The storage and retrieval component of today's information system is formed by database management systems (DBMSs), which abstract the peculiarities of storage media and processing components into a data model, integrity rules, and query facilities. Although strong relational DBMSs have become a commodity product for administrative information system applications, they have been proven rather inadequate for storing and search semi-structured data such as web data. The storage and retrieval component of today's search engines is formed by information retrieval (IR) systems, that provide effective

ranking strategies, efficient indexes, data compression focusing on user satisfaction rather than on integrity of the data.

Research themes that SIKS researchers address are:

- *Integration of Text, Data, and Streams*: Create ways to integrate data retrieval and information retrieval, for instance for XML databases and XML streams
- *Multimedia Retrieval*: Create easy ways to analyze, summarise, search, and view multimedia information such as video databases.
- *Reasoning about uncertain data*: Create ways to analyze, query and reason over imprecise and uncertain data.
- *Contextual Retrieval and User Interaction*: Use knowledge about the user's context to provide more effective results.
- *Sensor Data and Sensor Networks*: Create ways to manage and query networks of very large numbers of low-cost devices.
- *Learning Ranking Algorithms*: Create new models of information retrieval and machine learning of complex ranking functions.
- *Enterprise search and Data Spaces*: Integrate enterprise information to support business processes, for example expertise finding.

SIKS research leaders active in "Data Management, Storage and Retrieval"
-Prof.dr. P.G.M. Apers (UT)
-Dr. E. Hoenkamp (UM)
-Prof.dr. W. Jonker (UT)
-Prof.dr. M. Kersten (CWI/UvA)
-Dr.ir. A.P. de Vries (CWI/TUD)

3.3 How are the research foci operationalised?

- SIKS has appointed one "focus leader" per focus who plans and organises courses and other relevant events on a regular basis in close cooperation with the managing director and under the final responsibility of the scientific director.
- All focus directors have a seat in the SIKS Scientific Advisory Committee.
- The research foci typically provide topics for "advanced SIKS courses": in actual fact, all advanced courses organised in 2003-2008 already belong to one of these research foci.
- The research foci provide topics for scientific seminars, conferences, masterclasses and research colloquia.
- The research foci will provide anchors for external funding, and for external program development and policy making in ways that are representative of the IKS research field and community.
- Funding by SIKS: the budget for the advanced components stage of SIKS' educational program (See Chapter 4) is entirely reserved for educational activities directly related to the seven research foci of SIKS.

3.4 Results: How are SIKS PhD students doing?

Any research program and environment is ultimately to be judged by its results. This is also how we look at SIKS. If we allow for some (over)simplification, the results of SIKS are twofold:
(1) quality and productivity of the international scientific publications by the SIKS research groups;
(2) quality and productivity of the SIKS PhD research and degrees.

As empirical data for (1), Appendix C gives a list of (selected) key publications of the associated SIKS research groups over the reporting period 2003-2008.

As empirical data for (2): the "production" of good PhDs, there are several sources of empirical data that we will discuss in this Section in some more depth:

- Table 1 (in the introductory Section 1) gives a.o. an overview of the numbers of PhD students participating in the School and of the finished PhD degrees over the years.
- Appendix D gives the list of all successfully defended SIKS PhD Theses over the period 1998-2008 (also note that Appendix B gives an analysis of the financial sources for this).

On the basis of these data, we can say that overall SIKS is producing a good number of PhD degree doctorates. If we zoom in on the empirical data, we get the following – more refined – picture.

In Table 2 we show the current status of PhD students per year in the last decade, based on so-called input-cohorts. For example, from those students who started their PhD project in 2001 currently 11% is still underway, 70% obtained its doctoral degree and has published the thesis in the SIKS Dissertation series (see Appendix D), and 19% left the School (usually for industry) without a doctoral degree.

Table 2	Underway	Obtained Phd	Drop-out	
1998	0%	90%	10%	100%
1999	5%	78%	17%	100%
2000	20%	50%	30%	100%
2001	11%	70%	19%	100%
2002	26%	63%	11%	100%
2003	50%	41%	9%	100%
2004	76%	12%	12%	100%
2005	94%	0%	6%	100%
2006	94%	0%	6%	100%
2007	100%	0%	0%	100%

Table 2: SIKS PhD students: results in terms of input-cohorts 1998-2007

With respect to the duration of the projects, it is seen that most PhD students who are successful in the end, do not manage to complete their thesis within 4 years (most students work on a four years contract). This is, by the way, a very general pattern in the Netherlands in all disciplines.

In Table 3 we show the duration of successful PhD defenses per year of Public Defense. Unlike Table 2, we now look at the output-cohorts.

Table 3	<4 years	4-4.5 years	4.5-5 years	5-5.5 years	5.5-6 years	>6 years	Average
2002	12%	18%	29%	18%	5%	18%	63 months
2003	12%	16%	22%	22%	16%	12%	62 months
2004	15%	20%	25%	10%	15%	15%	60 months
2005	9%	24%	24%	24%	10%	9%	58 months
2006	14%	28%	41%	14%	0%	3%	55 months
2007	20%	24%	24%	12%	6%	14%	57 months

Table 3: SIKS PhD students: results in terms of output-cohorts 2002-2007

Interestingly, Table 3 shows a clear improvement in average duration of the PhD projects: after 2004 the average dropped below five years. In fact, the overall picture looks even better, if we consider in more detail how this average is calculated. We count the months from the start date of the PhD project until the date of Public Defense. Usually, the final manuscript has been finished and submitted or even approved by the reading committee 3-5 months before the date of the Public Defense. The delay is only due to the central university scheduling and organisational or

personal circumstances. It therefore seems practically fair to subtract three or four months from the average duration reported above.

Finally, a few observations and comments are in order on the prospects and career moves of our PhD students after their graduation. SIKS monitors this process. It appears that about 30% of our students re-enter the School, but now as a research fellow. Many of them become lecturers and even course directors in SIKS educational program themselves. About 15% also becomes employed as a researcher at a university in or outside the Netherlands, but is no longer involved in SIKS. Furthermore, about 10% performs research in a non-academic research centre (Philips, TNO, Yahoo Research, Google, to name a few). Without doubt the latter development is becoming a trend, especially in research areas such as Information Retrieval. About 42% works as a consultant, in industry (mostly) or in governmental organisations. Hardly 3% does not succeed in finding a suitable position.

In sum, we believe that SIKS is doing a solid job in developing and delivering good PhD doctorates. Although there are still things to desire in terms of duration and success percentage, the average situation for the SIKS PhD students compares favourably to the typical situation in the Netherlands in other disciplines. This also holds for finding a suitable job afterwards: for SIKS PhD students (and even dropouts) job prospects are very good.

4. Educational program

The main aim of the SIKS educational program is to offer PhD students a nation-wide educational program in Information and Knowledge Systems during the course of their PhD study that will provide them with broad basic knowledge as well as specialised, advanced training. Graduates will be high-quality researchers, possessing a thorough knowledge of the School's field of research, and specialised in the subject of their dissertation. They will be able to carry out fundamental research as well as put their knowledge to practical use. SIKS organises or co-organises such activities as basic courses (5 each year), advanced courses (usually 4 each year), master classes, seminars, research colloquia, doctoral consortia and lectures/tutorials given by visiting professors from abroad or senior staff members. The scientific director of SIKS is responsible for the (scientific) quality of the educational program. The managing director is responsible for the organisation of the program.

4.1 Educational Program 2003-2008

This section gives a brief overview of the education activities of SIKS in the period 2003-2008. We briefly discuss the main components of the educational program:

- Homogenisation stage
- Basic Course program
- Advanced Components

4.1.1. Homogenisation stage

The purpose of the homogenisation phase is to establish a minimum level of prior knowledge for all SIKS PhD students. Due to different backgrounds of students, it is important that tutors of basic courses know what kind of minimum level can be expected. In the early days of SIKS the homogenisation phase was considered highly relevant because a considerable percentage of our students didn't have a mainstream background in computer or information science; many students came from different scientific areas such as mathematics, philosophy, linguistics or psychology. In addition, substantial numbers of students are non-Dutch, including many non-European students who typically followed very different curricula. To make sure it is clear to every student what the expected background knowledge is for each subject area, the SIKS Scientific Advisory Committee prepared a document which, for each of these subject areas, gives a list of detailed "topics" together with suggestions for seminal textbooks for self-study. Supervisors are to make sure that their students meet these minimum requirements before attending basic courses. Course directors typically indicate which homogenisation topics are of particular importance for a specific course. This enables students to check before attending a course whether they have the required background knowledge to follow the course.

4.1.2 Basic Course program

As of 2003 SIKS started a Basic Course program that consists of 11 courses:

B0. *Research methods and methodology for IKS*

B1. *Formal methods for IKS*
B2. *System modelling*
B3. *Knowledge modelling*
B4. *Combinatory methods*
B5. *Learning and reasoning*
B6. *Agent technology*
B7. *Interactive systems*
B8. *Information and organisation*
B9. *Information retrieval*
B10. *Software architecture*

The course B0 is organised each year and is required for all SIKS PhD students. The other courses are organised once every two years. Each year, four basic courses were offered to the students. Students were to follow at least six courses of the Basic Course program. It is allowed to take the remaining two courses in another Research School or take a Summer School that has an equivalent study load.

On average, the basic courses are attended by 30-40 PhD students. Feedback from the PhD students was generally positive. Comments were made about improving course coherence, and they are employed as input by the Course director for preparing the next edition of the course. Also, students typically displayed a mixed attitude toward presentations from industry. Industry presentations systematically get lower average grades from participants. This led to an overall decrease in the number of presentations from industry. However, SIKS considers it important maintaining relations with industry, and lecturers with successful presentations are invited again (see also Chapter 5).

All basic courses have been organised by SIKS in conference centres, where the participants stay in-house for four days. This social aspect is an important added value that is mentioned by many students as a positive aspect of the course program. Furthermore, the management team of SIKS decided that (if possible) the scientific director or the managing director are present at each SIKS activity, to strengthen cohesion, to support the course directors, to evaluate all aspects of the course, and to keep in personal touch with the rapidly growing number of PhD students. In recent years, SIKS has increased its financial and managerial efforts to organise its Basic Course activities in this way.

4.1.3 The Advanced Components

The Advanced Components Stage of the SIKS educational program exists of Advanced Courses and so-called other advanced components activities.

Advanced Courses
The Advanced Courses were part of the original education plan of SIKS, but really only got off the ground in 2001. Until then, the Research School was mainly concerned with setting up a good Basic Course program. When this goal was achieved and both the financial position and organisation of the School improved, more attention could be given to the advanced courses. Unlike basic courses, advanced courses are not compulsory for students. They are typically intended for PhD students with research projects related to the course topic. SIKS tries to offer a broad range of advanced courses, such that students can attend a good number of courses that are of interest to them. Advanced Courses typically have a duration of two days and are also organised in a conference centre; we refer to Appendix A for a detailed yearly overview.

All lectures are taught by professionals working in the field. Course directors can indicate which basic courses are required as background knowledge for attendance of an advanced course. Despite their non-compulsory character, advanced courses usually were attended by 25-35 PhD students. Also these advanced courses are systematically evaluated. Feedback from the PhD students was generally positive. Especially, coherence of the topics of these intensive two-day courses was strongly appreciated. Unlike the basic courses, the advanced courses have been noticed by industry as well; each time several employees of ICT companies, usually working at the research department, attended the courses, thus providing SIKS with some additional revenues as well. As can be inferred from Appendix A, SIKS has taken great efforts in the period 2003-2008 to further develop the Advanced Courses of its educational program, and will continue to do so (see Section 4.2).

Other advanced components activities
In the period 2003-2008 many master classes, research seminars and workshops were organised: see Appendix A for a complete overview. They typically have a duration of a half day or a full day, occasionally two days. Master classes and workshops are often organised "on site" by a SIKS group in cooperation with the SIKS office and (co-)financed by our School. SIKS encourages members to organise master classes whenever a well-known researcher visits a SIKS research group, such as in the case of a PhD defence or a sabbatical leave. In return, SIKS pays (part of) the travelling money for the speaker and organisational costs of the university involved. Usually, the SIKS office assists the local organisation by making all necessary arrangements (announcements, reservations, contracts and payments). This “formula” works well in practice. It is the policy of SIKS to also increase also this type of activities even further in the near future, as explained in Section 4.2.

A second kind of SIKS advanced activities concerns the close cooperation between the School and several successful national (more precisely: Dutch-Belgian) conferences, which are organised annually under auspices of or in cooperation with SIKS. To name the most important:
-BNAIC: Belgium Netherlands Artificial Intelligence Conference;
-BENELEARN: Belgium Netherlands Machine Learning Conference;
-DIR: Dutch-Belgian Information Retrieval Workshop;
-DBDBD: Dutch-Belgian DataBase Days;
-EIS: Dutch-Belgian Enterprise Information Systems Conference (founded by SIKS in 2006);
-CLIN: Computer Linguistics In the Netherlands.

All these conferences relate to one or more research foci of SIKS and, without exception, SIKS research fellows are part of the local organisation or board members of these conferences.
For SIKS PhD students these events are a nice opportunity to present and discuss their work. With the exception of BNAIC, SIKS pays the conference fee for all of its PhD students, and usually takes part in the organisation (costs) as well. Finally, it was decided in January 2008 by the Board of SIKS to make these events freely accessible to all SIKS members. By making this financial investment we intend to achieve that these conferences evolve in a subsidiary role as annual “SIKS foci days”.

A third element of the “other advanced components activities” of SIKS relates to the strong international position of our members. In recognition of this, they are often successful in attracting the organisation of important international conferences in the IKS field, such as as Adaptive Hypermedia (2004), AAMAS (2005), Computer Games Olympiade (2006), SIGIR (2007), and in the near future the CAiSE (2009). SIKS benefits from the fact that their members serve as local organisation, by making special arrangements and deals regarding the participation of the SIKS PhD students. For example, SIGIR 2007 organised an extensive tutorial program, which was freely accessible to all SIKS PhD students, as SIKS paid their fees.

The same story applies to international Summer Schools such as EASSS, AAAI, and the TenCompetences Winter School. The cooperation with EASSS started in 2005 in Utrecht and continues, also when the event does not take place in the Netherlands. SIKS managed to make arrangements for its students in Annecy (2006), Durham (2007) and Portugal (2008).
It turns out that this aspect of our advanced components activities is highly appreciated by our members. We therefore intend to organise more of these activities, inside or outside the Netherlands.

Finally, SIKS also encourages SIKS research groups to bring research colloquia of a group or university to the attention of all SIKS researchers, including the SIKS PhD students. Successful examples are the CABS research colloquium, the Agent colloquium, the UU seminars and the SIKS-IKAT colloquia, organised in cooperation with the respective SIKS member universities. All these activities were co-organised and co-financed by SIKS.

As Appendix A shows, the decision to put more emphasis on the Advanced Components activities of the SIKS educational program already led to results in 2007, witness the high number of advanced components activities.

4.2. Educational Program 2009-2015

The scope of SIKS has recently broadened. For example, information science has become a more important research area than in the early years of the School, partly due to the admission of new groups in this field. The newly established research focus *Enterprise Information Systems* will also show some impact on the educational activities. However, as we will point out, only a limited revision of the program of basic courses is deemed necessary. In addition, SIKS intends to keep the current momentum in organising a growing number of advanced courses, master classes, seminars and tutorials on a broad range of subjects.

4.2.1 Homogenisation stage

Due to the fact that today the majority of SIKS PhD students have a solid background at the Master level in computer science or information science, the homogenisation stage has lost much of its significance, and it will no longer play a big role in the planning of the future Basic Course program. However, a brief "operational" description of the topics will be preserved for those students who took their Masters in related disciplines and for their supervisors who may feel uncertain whether participation in SIKS is useful.

4.2.2 The Basic Course program

SIKS has now run the current basic program for almost six years (2003-2008). The request for re-accreditation is a logical point in time for program refinement based on the gained experiences. In 2007 the SIKS Scientific Advisory Committee proposed a revision and streamlining of the basic course program. There are several (sometimes interrelated) reasons for such a revision:
- SIKS PhD students have expressed the wish for more freedom in selecting relevant courses;
- It appeared practically difficult to organise *all* ten basic courses in the planned two-year cycle;
- New trends have emerged in the field of SIKS.

The main reason to streamline the number of courses however, is a strategic one: SIKS is convinced that in the next accreditation period the School can best create added value for its members by investing heavily in the advanced components activities. Unlike local institutions such as graduate schools, it can use and mobilise its national-level resources and expertise to organise advanced courses and masterclasses, which brings the student to the international forefront of current research in the IKS field.

The new Basic Course program has started in 2007 already.

B0. Research methods and methodology for IKS
This course is required for all students and will therefore be organised each year. It intends to cater for the observation of many supervisors that students often lack an adequate methodological background for doing research. This course is not a "generic" research methods course, but tackles methodological issues specifically in the context of computer science and information systems research.
Course directors: Dr. H. Weigand (UvT), Prof.dr. R.J. Wieringa (UT), Prof.dr. J.-J.Ch. Meyer (UU), Dr. R. Starmans (UU), Prof.dr. J.M. Akkermans (VUA).

In addition, SIKS has eight basic courses on particular subjects, of which at least six are required. This should ensure a sufficiently large freedom of choice for the individual student.

B1. Combinatory methods
Mix of classical symbolic and subsymbolic techniques: neural networks, constraint satisfaction problems, complexity of graph algorithms, intelligent search methods, game programming, heuristics in games.
Course director: Dr. N. Roos (UM)

B2. Learning and reasoning
Mix of symbolic and subsymbolic techniques from an AI perspective by consistent application of the "learning and reasoning" metaphor: Probabilistic reasoning / Introduction Bayesian networks, introduction machine learning, reinforcement learning, learning and reasoning for information access, qualitative reasoning, argumentation systems, model based reasoning.
Course directors: Dr. A. Ten Teije (VUA), Dr. G.A.W. Vreeswijk (UU)

B3. Agent technology
For the main part based on symbolic AI. Introduction multi-agent systems: agent logics, agent theories, agent architectures, agent programming, norms/ institutions/deontic logic, planning, coordination, conflict resolution in MAS, negotiation, mechanism design and auctions.
Course directors: Prof.dr. J.-J.Ch. Meyer (UU), Prof.dr. C. Jonker (TUD), Prof.dr. C. Witteveen (TUD)

B4. Formal methods for IKS
Basic modal logic, epistemic logic, temporal logic, dynamic logic, deontic logic, description logic; Information theory, statistical techniques for AI.
Course directors: Prof.dr. J.-J.Ch. Meyer (UU), Prof.dr. E.O. Postma (UM)

B5. System and architecture modelling
Information, function, and process modelling; Architectures for IKS, Intro to business-ICT alignment, Enterprise architecture, and Service-Oriented Computing.
Course directors: Dr. W.-J. Van den Heuvel (UvT), Dr. P. van Eck (UT)

B6. Information retrieval
Capita selecta IR (formalisms, models), probabilistic models for IR, multi-media retrieval, empirical methods for IR, multi-media retrieval, XML retrieval, web mining en web retrieval, automatic query improvement.
Course directors: Prof.dr.ir Th. van der Weide (RUN)

B7. Interactive systems
Human computer interaction, Hypermedia, Adaptive hypermedia, Intelligent multimedia, Web-based information systems.
Course directors: Prof.dr. G. van der Veer (VUA/OU), Prof.dr. P. de Bra (TU/e)

B8. Knowledge modelling
Ontologies, Epistemology and Models; Modelling with Description Logics; Methodology for Ontology engineering, KADS, OWL: Ontology Language for the Web; Ontology patterns, Re-use of information.
Course director: Dr. B. Bredeweg (UvA)

4.2.3 The advanced components

First and foremost, for the next period, SIKS intends to further expand and improve the advanced courses. The start of the bachelor/master structure on a European scale and of graduate schools at Dutch universities has created a need for more advanced courses that bring students up to the frontline of current research. As stated earlier, advanced course topics will be related to the newly established research foci: to maintain consistency between research and education, to easily adopt and integrate new topics and issues into the educational program, but particularly to fully exploit the expertise of our researchers working on these foci.

The fact that SIKS PhD students have expressed the wish for more freedom in selecting relevant educational activities is also a good reason to increasingly cooperate with other partners and organisations, so as to enable our students to participate in these activities without additional costs. A fully "tailor-made" program for each student is not possible. However, we try to differentiate the program as much as possible to cater for the diversity of research interests.

Furthermore, SIKS intends to organise master classes, tutorials and research seminars more frequently than in the past. We deem it very important to offer these activities to our students,

since by these advanced activities the expertise within the School as well as the expertise of the extended network of international contacts we maintain, can be employed most fruitfully for educating our students. In addition, SIKS also expects a growing interest of industrial organisations to participate in the advanced components stage.

Finally, SIKS has started to organise doctoral consortia for PhD students on a more regular basis. *Idealiter*, students would give at least two presentations at such a doctoral consortium: one in the first year in which the overall research plan is presented and discussed, and a second one in the final year summarising the main results.

5. Cooperation and Communication

5.1 Cooperation and communication: internal

SIKS stimulates and facilitates cooperation and communication *within* the School in several ways.

1. For each basic course and advanced course two or three course directors are appointed, usually from different SIKS groups.

2. SIKS makes sure that all groups are actively involved in the educational program: over 100 staff members from all SIKS groups have lectured in the last six years.

3. The focus directors assist the scientific director and the managing director in planning activities and to stimulate more involvement of senior staff members in and between SIKS groups.

4. Each PhD research plan requires the appointment of a “co-advisor”, typically a research fellow, from a different research group than the one in which the PhD student is working. This co-advisor monitors the progress of the PhD student through the years at a distance and usually becomes a member of the reading committee. In practice we handle this requirement in a liberal way, in the sense that at least one senior SIKS member not part of the research group of the PhD student participates in the reading committee. Practice shows that sometimes 3, 4 or even more SIKS members are participating in the reading committee.

5. Since 1999 SIKS organises annually a meeting for the entire SIKS community, alternately in Amsterdam and Utrecht, to meet each other in an informal setting, to evaluate last years activities, and to discuss plans for the future.

6. In many national and international research projects researchers from different SIKS groups and universities are involved.

7. In order to stimulate communication and interaction between our PhD students, all our basic courses and advanced courses have been organised in conference centres where the participants stay in-house for several days. This social aspect is an important added value that is mentioned by many students as a positive aspect of the course program. Furthermore, the management team of SIKS has decided that (if possible) the scientific director or the manager are present at each SIKS course, to strengthen cohesion, to support the course director, and to evaluate all aspects of the course. SIKS makes significant financial and organisational efforts to organise these activities in this way.

8. To stimulate communication between its members, the SIKS office maintains a very active daily mailing list. This *members mailing list* is an open mailing list for members of SIKS maintained by the SIKS office, enabling all 400 members to make announcements regarding national and international conferences, seminars, courses, visiting professors, public PhD defense occasions, and – increasingly important – scientific job vacancies in and outside the Netherlands. Communication is restricted to scientific non-commercial activities. In 2007 over 500 messages were distributed, covering all main events in the field of Information and Knowledge Systems in the world. Yearly, the SIKS office receives over 3000 reactions (requests, applications and comments) related to the announcements.

9. Increasingly, the SIKS office becomes a service centre for the SIKS community. For example, project details of all PhD projects are available for all SIKS members. Furthermore, we study developments and trends in the IKS field in the Netherlands, such as research themes and topics, structure of funding, activities of our alumni etc. In the last years several reports have been published and made available to our members. Appendix B gives a sample of this service work by

the SIKS office. As a result more and more researchers contact the office with questions related to research policy issues, trends, and activities SIKS is involved in.

5.2 Cooperation and communication: external

Cooperation and communication by SIKS with relevant groups *outside SIKS* takes place along several lines.

1. *Customer Relations Mailing List*
SIKS maintains a mailing list with all previous external course participants: ICT employees or consultants from industry, PhD students from other Research Schools, and other academics, sometimes working at universities in Belgium. This list enables us to invite these relations to take courses, masterclasses and make them a special offer for participating in these activities. As we mentioned already, there is a growing interest among these groups for our intensive two-days advanced courses. This is an excellent opportunity not just to maintain relations, but also to gain financial revenues, which are then invested in new courses.

2. *Relationships with companies*

- SIKS maintains an advisory board of leading scientists with industrial background. The advisory board meets once a year with the SIKS board of governors and the SIKS advisory scientific committee to discuss current research in SIKS and current trends and application needs in society.
- A growing number of employees of ICT companies attend our courses and are placed on the Customer Relations mailing list. Because their background differs from the typical SIKS PhD student, who is employed at a university, mutual exposure to each other's context turns out to be very useful. SIKS maintains a repository of lecturers from industry who successfully performed at SIKS courses and will be re-invited.
- A growing number of companies is willing to pay the SIKS contribution for so-called “third money flow PhD students” (externally funded PhD students). These researchers work in industry, but have access to the university research infrastructure and have a SIKS staff member as promotor or co-promotor. They thus get the opportunity to become a SIKS PhD student and participate in the SIKS courses.

Of course, many senior researchers in SIKS have intensive contacts with industry, ranging from regularly giving advice to active collaborations with research done within companies, either directly or in consortium-based national and international research projects.

3. *SIKS and research programs*
SIKS research leaders play important roles in setting up national research programs financed by the National Science Foundation NWO, and the Ministries of education, culture and science (OC&W), economic affairs (EZ), and major industries. Here, we want to mention the NWO research programs such as Digital Information Super Highway (DISH), Multimedian (MM), Requirements Engineering (RE) and Software Architecture (SA), ToKeN2000 (accessibility and dissemination of knowledge in the Netherlands), CATCH (Continuous access to cultural heritage), and JACQUARD (software engineering and Software as Service). At the European level, SIKS research leaders play their role in EU-funded research, particularly in the IST/ICT Framework programs (DG-INFSO, especially semantic-based methods and content, and software/information systems and services; to a small extent also DG-Research and DG-TREN).

As to national scientific platform functions, worthwhile to mention is that SIKS is signatory to IPN, the national platform for computer science research, which advises the National Science Foundation NWO, and has played and continues to play a major role in the establishment and periodic maintenance of NOAG-I, the Dutch national research agenda for computer science. Furthermore, the scientific director of SIKS represents the School in several national policy committees.

4. *Cooperation SIKS – conferences / organisations*
Here, SIKS has a long-lasting cooperation with the BNVKI: the Society for Artificial Intelligence researchers in the Netherlands and Belgium. SIKS takes part in the organisation of the annual conference of this organisation and has its own section in the BNVKI Newsletter, which appears six times a year. Furthermore, there are several other annual conferences organised under auspices and in cooperation with SIKS. These include the Dutch Belgian Database Day (DBDBD), the Dutch-Belgian Information Retrieval Workshop (DIR), the Belgium-Netherlands Machine Learning conference (Benelearn) and the Dutch-Belgian Conference on Enterprise Information Systems (EIS), which was founded by SIKS in 2006 and which is currently organised by SIKS in cooperation with the BENAIS, the Belgium-Netherlands Chapter of the AIS Society. The Advanced Course “Multi Agent Systems: Theory, Technology and Applications” in 2007 was organised by SIKS in collaboration with the Research School TRAIL.

Due to the cooperation with the mentioned organisations SIKS members can participate for free in DBDBD, Benelearn, DIR and EIS. Since 2005 SIKS also cooperates with the EASSS, the European Summer School for agent systems enabling all SIKS PhD students to participate in this Summer School for free.

5. *Cooperation SIKS – alumni*
Currently SIKS has over 170 alumni who finished their PhD project in the period 1998-2007. About 30% is currently a SIKS member, whereas about 15% works at a university, but is not a SIKS member anymore. The rest works for companies or government. Alumni are allowed to remain on the mailing list, they are invited for the SIKS Annual Day, and they can participate in workshops and masterclasses for free. It is quite encouraging to observe that many former PhD students who took the SIKS courses themselves, re-enter the School as a research fellow or senior research fellow after their graduation, and become actively involved in the training program for the next generation of PhD students, as a lecturer or even course director.

5.3 International contacts and cooperation

SIKS research leaders have many contacts in the international research community and play an important role in this community as leader, editor, organiser, program chair, PC member, coordinator, of important international projects, journals and conferences. Without this, the advanced components of the SIKS program like master classes, invited lectures and advanced research seminars simply would not be possible. Appendix A further substantiates this in its overview of the SIKS advanced components activities organised in 2003-2008.

6. Organisation and Finance

6.1 Committees in SIKS

Management Team:
Prof.dr. R.J. Wieringa (UT), Scientific Director
Dr. R.J.C.M. Starmans (UU), Managing Director
Prof.dr. J.M. Akkermans (VUA), Chair Board of Governors

Board of Governors:
Prof.dr. J.M. Akkermans (VUA), Chair
Prof.dr. P.M.G. Apers (UT)
Prof.dr. P.M.E. de Bra (TU/e)
Prof.dr. H.J. van den Herik (UM)
Prof.dr. A.P.J.M. Siebes (UU)
Prof.dr. P. Sloep (OU)
Dr.ir. A.P. de Vries (CWI/TUD)
Dr. H. Weigand (UvT)
Prof.dr. B.J. Wielinga (UvA)
Prof.dr.ir. Th.P. van der Weide (RUN)
Prof.dr. C. Witteveen (TUD)

Scientific Advisory Committee:
Prof.dr. F. van Harmelen (VUA), Chair
Dr.ir. D. Hiemstra (UT)
Prof.dr.ir. G.-J.Houben (TUD)
Prof.dr. J.-J.Ch. Meyer (UU)
Prof.dr. E.O. Postma (UM)
Prof.dr. G. van der Veer (VUA/OU)
Dr. H. Weigand (UvT)

Advisory Board:
Dr. H. van den Berg (BizzDesign)
Prof.dr. R. Meersman (Free University Brussels)
Prof.dr. L. Steels (Sony Research/Free University Brussels)
Dr. G. Wijers (Morgan Chambers)
Dr. V. Zimmermann (IMC Advanced Learning Solutions)

PhD Students Advisory Committee:
Drs. L. Bodenstaff (UT)
Drs. B. Kratz (UvT)
Drs. V. Pijpers (VUA)
Drs. M. Schadd (UM)
Drs. N. Vergunst (UU), Chair
Ir. S. Verwer (TUD)

The SIKS Board of Governors is the general leading body of SIKS, overall responsible for devising and deciding its policies and overseeing its operations. Each participating institution has one representative in the Board of Governors.

The Scientific Advisory Committee advises the Board of Governors on all scientific matters, especially on the Research Program (the research foci) and the Educational Program. The research focus directors take part in the Scientific Advisory Committee.

The role of the Advisory Board is to foster relationships between SIKS research and applications in society. The (external) Advisory Board meets once a year with the SIKS Board of Governors and the Scientific Advisory Committee to discuss current research in SIKS and current trends and application needs in business and government.

The role of the PhD Students Advisory Committee is to represent the SIKS PhD students and advise the scientific director and Board of Governors on all aspects of the educational and scientific program of the School that are relevant for the PhD students and, furthermore, to support the managing director in organising and planning the activity program of SIKS. Among other things the latter task may include:

- Organising a PhD contribution / presentation at the annual SIKS Day;
- Organising social events during 4-day SIKS-courses;
- Organising an annual "day in the country" for SIKS Phd students;
- Organisation of Alumni days;
- Organisation of Meeting days with industrial companies;
- Assisting in evaluation of the SIKS courses.

6.2. Participating Institutions

- VU University Amsterdam (VUA): Faculty of Exact Sciences (Administrative university)
- Utrecht University (UU): Faculty of Science
- University Twente (UT): Electrical Engineering, Mathematics and Computer Science
- University of Amsterdam (UvA): Faculty of Computer Science, Faculty of Law
- University Maastricht (UM): Faculty of Humanities and Sciences
- Technical University Delft (TUD): Faculty of Information technology and Systems
- Eindhoven University of Technology (TU/e): Faculty of Mathematics and Computer Science
- Radboud University Nijmegen (RUN): Faculty of Computer Science
- University of Tilburg (UvT): Faculty of Economics
- Open University of the Netherlands (OU): Educational Technology Expertise Centre
- Centre for Mathematics and Computer Science (CWI): Cluster of Information systems, Cluster of Software Engineering

Apart from this, SIKS also counts a few associated researchers who are not related to one of the above-mentioned participating institutions.

6.3 Financial position

In recent years the SIKS financial position has improved. In 1998 the total annual budget was EUR 45,000. In 2008 the estimated budget is about EUR 230,000. As part of this total budget, the annual support given by the administrative university, the VU University Amsterdam, is slightly over EUR 45,000. Clearly, the significant increase in members has generated the major part of the budget of the SIKS School. Course fees of external participants have also led to some welcome revenues for the School.

The VU University Amsterdam has agreed to be the administrative university also for the period 2009-2015, and to continue funding SIKS with at least EUR 45,000 yearly. Further, in spring 2008, all ten universities currently participating in SIKS have re-affirmed their cooperation and financial commitments for a period of six years. As a result, the annual revenues in the next accreditation period will be sufficient to guarantee the continuation of a full-time appointment (1.0 fte) for the managing director, a part-time appointment (0.4 fte) for a secretary, and a continuation and strengthening of the national PhD research and education program, as described above. On top of the expected cash flow, which is aimed by the SIKS Board to be adequate to maintain the daily

activities planned for the coming period 2009-2015, the School prudentially maintains a financial reserve (adequate for several months of operations) so as to stay somewhat independent of the policy fluctuations that these days characterise the Dutch academic situation. The current (2008) financial reserve is fully in line with this. Hence, the SIKS Board of Governors is confident also for the coming period that SIKS will continue to be the successful academic undertaking it is now.

All in all, the financial position of the School for the next accreditation period appears to be solid. It may even improve somewhat due to a rise in external participants of SIKS activities and newly admitted members. As stated before, improved financial resources will especially be invested in strengthening the Advanced Courses and other advanced components activities of the SIKS program.

7. Conclusion

As evidenced in this report, SIKS as a KNAW-accredited Research School has evolved from a relatively small entity of about 100 researchers in 1998, into a substantial and stable body that counts more than 400 researchers in 2008, representative of the scientific community in Information and Knowledge Systems in the Netherlands. SIKS now plays an instrumental and fruitful role at the national level in creating a shared research environment, in the associated education of PhD students, and in the delivery of international-quality doctorates. It does so especially by successfully running – already for many years now – a broad and high-quality PhD course program. Accordingly, SIKS now enjoys an established position within the scientific community in the Computing and Information Sciences in the Netherlands.

For the reporting period 2003-2008 the key points to note are:

- IKS research is flourishing in the Netherlands as visible in the strong growth of PhD projects and finished dissertations in the field. SIKS has been a crucial factor in this development.
- SIKS now covers the vast majority of IKS researchers in the country. The School has proven to be an attractive umbrella and platform for IKS researchers in the Netherlands, as witnessed by the sizeable growth of the School, now comprising about 200 PhD students and over 200 senior researchers.
- SIKS has a productive and focused state-of-the-art research program in the form of the discussed research foci within Information and Knowledge Systems, reflecting the interests and strengths of the participating research groups from the various Dutch universities.
- The international excellence and competitiveness of the participating groups has increased, as demonstrated for example by the increase of external acquisition of national and international research funds. A growing number of our SIKS PhD students are paid out of these funds.
- SIKS has consolidated a broad and sound national educational program for PhD students, which has been highly successful as measured by the number of activities as well as the steady high attendance.
- SIKS has established a stable organisational structure and a solid financial position that warrants a high degree of confidence regarding the continuity of its activities.

We note that the funds of SIKS mainly come from its own members, and they are provided first of all for the purpose of enhancing the education of the enrolled PhD students. As such, SIKS is very much to be viewed as a form of independent self-organisation of the IKS field. Rather than attempting to control the research program of its participating groups, its attractiveness lies in the SIKS platform and networking function for its members, its active furthering of a shared first-rate research environment, its ability to influence Dutch research policy through IPN (Informatics/CS Platform of the Netherlands) and other bodies, and in its offering of a top-quality PhD educational program with an international outlook. We strongly believe that this will continue to be the case and, hence, that this continues to be the appropriate strategy for SIKS.

For the coming accreditation period 2009-2015 some important points of attention will be:

- We will further strengthen and expand in particular the advanced components of the PhD educational program.
- Furthermore, we intend to increase special activities such as master classes, thereby drawing upon the many international collaborations of and reputed visiting senior researchers from abroad at the various SIKS groups.
- Rather than on a further growth of the size of the School, the focus will be on further enhancing the excellence and careers of the participating young researchers, and on enhancing the national platform and representation function of the School.
- In the wake of the introduction of the Bachelor-Master system, we will closely follow possible further changes in the university system in the Netherlands. Some universities consider or are in the process of establishing *local* graduate schools, and some of them might be seen as having possible overlap with SIKS. In this changing environment, SIKS will continue to play a

role. First, the local graduate schools will likely have an emphasis on the Master rather than PhD level, whereas SIKS has a complementary function especially through its advanced courses and other advanced components that bring the PhD student up to the current front of research. Second, SIKS bundles research expertise at a national level, delivering a PhD-level educational program with a breadth and depth that is extremely difficult to offer and sustain by local graduate schools.

As a *national* collaboration of ten-plus universities and several hundreds of researchers in Information and Knowledge Systems, SIKS enjoys and exploits significant economies of scale as well as scope. This warrants confidence in the role and significance of SIKS also for the coming years.

Appendices:

APPENDIX A: SIKS Activities 2003-2008

APPENDIX B: Some trends in funding IKS Research in The Netherlands

APPENDIX C: Key publications of SIKS Groups 2003-2008

APPENDIX D: SIKS Dissertation series 1998-2008

APPENDIX A: Activities SIKS 2003-2008

Activities 2003

Basic courses

"Combinatory Methods", June 02-04, 2003, Conference Center Woudschoten, Zeist
Course director: Dr. N. Roos (UM)

"Learning and Reasoning", May 04-06, 2003, Conference Center Woudschoten, Zeist
Course director: Dr. A. ten Teije (VUA)

"Formal methods for IKS", December 08-10, 2003, Landgoed Huize Bergen, Vught
Course directors: Prof.dr. E.O. Postma (UM), Prof.dr. J.-J.Ch. Meyer (UU)

"Agent systems", December 10-12, 2003, Landgoed Huize Bergen, Vught
Course directors: Prof.dr. C. Jonker (RUN), Prof.dr. J.-J.Ch. Meyer (UU)

Advanced Courses

"Intelligent data-analysis", 27-28 February 2003, Conference Center Woudschoten, Zeist
Course directors: Prof.dr. A.P.J.M.Siebes (UU), Dr. J.C.Bioch (EUR)

"Implementing Intelligent Search in XML", May 15-16, 2003, Conference Center Woudschoten, Zeist
Course director: Dr. H. Blanken (UT)

"Mobile Commerce" (m-Commerce) April 17-18, 2003, Amsterdam
Course directors: Prof.dr. H. Akkermans (VUA), Dr. N. Sadeh (CMU/VUA)

Summer course on Datamining, July 07-11, 2003, Maastricht
Course directors: Dr. E. Smirnov (UM), Dr. J. Donkers(UM), Prof.dr. E.O. Postma (UM)

"Architecture-Driven Software development", Nov 24-25, 2003, Conference Center Woudschoten, Zeist
Course director: Prof.dr. E.O. Proper (RUN)

Other activities

- Theory Day 2003 NVTI, March 7, Utrecht
- SIKS / ILLC-Symposium on "Adaptive Languages for Information Systems", March 14 Amsterdam
- 15-16 May 2003 Advanced Course: "Implementing intelligent search in XML data", Zeist
- SIKS / IKAT Symposium "Brain, Language, and Artificial Intelligence", June 13, Maastricht
- 30 June 2003 Masterclass on Communication Modelling , Tilburg
- 1-2 July 2003 International Working Conference LAP 2003, Tilburg
- 5 July 2003 Workshop "Future of Neural Networks" , Rotterdam
- 17 September 2003 Seminar "Simulation in Economics" , Rotterdam
- 22 October 2003 Workshop "Learning solutions", Nijmegen
- 23-24 October 2003 BNAIC 2003, Nijmegen
- 20 November 2003 Conference on Information Science 2003, Eindhoven
- 04 December 2003 Workshop "Opponent Models in Games", Maastricht
- 08-09 December 2003 DIR 2003: 4th Dutch-Belgian Information Retrieval Workshop,

Amsterdam
- 10 December 2003 Masterclass on Normatics, Utrecht
- 11-12 December 2003 JURIX 2003, Utrecht
- CABS-colloquium, organised seven times in Delft and Utrecht
- SIKS / IKAT-colloquium, organised six times in Maastricht

Activities 2004

Basic courses

Research methods and methodology for IKS, February 09-11, 2004 Het Bosgoed, Lunteren
Course directors: Dr. H. Weigand (UvT), Prof.dr. R. Wieringa (UT), Prof.dr. J.-J.Ch. Meyer (UU), Dr. R. Starmans (UU)

Interactive Systems, May 14 - 16, 2004, Huize Bergen, Vught
Course director: Prof.dr. G. van der Veer (VUA)

Architectures for IKS, May 16 - 18, 2004, De Bergse Bossen, Driebergen
Course director: Prof.dr. E. Proper (RUN)

Information and Organisation, December 06-08, 2004, Huize Bergen, Vught
Course director: Dr. H. Weigand (UvT)

Information Retrieval, December 08-10, 2004, Huize Bergen, Vught
Course director: Prof.dr. Th. van der Weide (RUN)

Advanced courses

Spring course on Datamining, April 13-17, 2004, Maastricht
Course directors: Dr. E. Smirnov (UM), Dr. J. Donkers (UM), Prof.dr. E.O. Postma (UM)

"Mobile Commerce" (m-Commerce) April 21 and 22, 2004, Amsterdam
Course directors: Prof.dr. H. Akkermans (VUA), Dr. N. Sadeh (CMU/VUA)

"The semantic web", November 22 - 23, 2004, Conference center Woudschoten, Zeist.
Course directors: Prof.dr. F van Harmelen (VUA), Prof.dr. G. Schreiber (VUA)

Other activities
- SIKS/ICS Symposium on Agent Organizations, January 13, 2004, Utrecht
- Paradoxaal, een symposium over paradoxen, March, 03, 2004, Utrecht
- Theoriedag 2004 van de NVTI, March 05, 2004, Utrecht
- SIKS-day 2004, March 12 2004, Castle of Zeist, Zeist
- Workshop: Intelligent Risk Analysis & Management, May, 19, 2004, Rotterdam
- Workshop on XML Databases and Information Retrieval, June 21, 2004 Enschede
- Symposium "Agents Everywhere", July 02, 2004, Enschede
- Social Intelligence Design 2004, July 05-07, Enschede
- AH2004; conference on Adaptive Hypermedia 2004, August 23-26, 2004, Eindhoven
- ICEC 2004; conference on Entertainment Computing, September 01-03, 2004, Eindhoven
- SIKS/ICS Master Class on Agent Societies, October 13, 2004, Utrecht
- Symposium “AI in the Wild”, October 20 2004, Groningen
- BNAIC 2004, October 21-22, 2004, Groningen
- SIKS/ICS Masterclass “Logic and Agents: It is all in the game”, November 24, 2004 Utrecht

- SIKS Masterclass by Kalle Lyytinnen;*"Innovation in Software Development and Architecture"* , November 29, 2004 Enschede
- SIKS-IKAT Research colloquium: organised 6 times in Maastricht
- CABS-SIKS Research colloquium, organised 7 times in Delft en Utrecht
- IKS-SIKS Information science seminar, organised 9 times in Utrecht

Activities 2005

Basic courses

“Research methods and methodology for IKS", November, 21-23, 2005, Woudschoten, Zeist
Course directors: Dr. H. Weigand (UvT), Prof.dr. R. Wieringa (UT), Prof.dr. J.-J.Ch. Meyer (UU), Dr. R. Starmans (UU)

“Combinatory Methods”, May 09-11, 2005, Landgoed Huize Bergen, Vught
Course director: Dr. N. Roos (UM)

“Learning and Reasoning”, May 11-13, 2005, Landgoed Huize Bergen, Vught
Course director: Dr. A. Ten Teije (VUA)

“Formal methods for IKS”. December 19-21, 2005, Landgoed Huize Bergen, Vught
Course directors: Prof.dr. E.O. Postma (UM), Prof.dr. J.-J.Ch. Meyer (UU)

“Agent systems” December 21-23, 2005, Landgoed Huize Bergen, Vught
Course directors: Prof.dr. C. Jonker (RUN), Prof.dr. J.-J.Ch. Meyer (UU)

Advanced courses

“Computational Intelligence”, February 17-18 2005, Woudschoten, Zeist
Course directors: Prof.dr. A.P.J.M. Siebes (UU), Dr. U. Kaymak (EUR)

"XML: where databases and information retrieval meet", April 18-19, 2005, Leusden
Course directors: Dr.ir. D. Hiemstra (UT), Dr.ir. M. van Keulen (UT)

“Summer course on Datamining”, June 27- July 01, 2005, Maastricht
Course directors: Dr. E. Smirnov (UM), Dr. J. Donkers (UM), Prof.dr. E.O. Postma (UM)

“Business Process Integration", September 19-20, 2005 Best Western Dish hotel, Enschede
Course director: Dr. H. Weigand (UvT)

Other activities
- 10-11 January 2005 Workshop on Information Retrieval, DIR 05, Utrecht
- 26 January 2005 SIKS-IKAT Symposium "Go at the frontiers of AI", Maastricht
- 17-18 February 2005 Benelearn 2005, Enschede
- 15 March 2005 Symposium: Waarheid in Taal, Amsterdam
- 19 May 2005 IKAT-SIKS Symposium: Machine Learning for Commercial Game AI , Maastricht
- 18-22 Juli 2005 EASSS 2005; agent systems summer school, Utrecht
- 17-18 October 2005 BNAIC 2005, Brussel
- 31 October 2005 Dutch-Belgian Database Day, Amsterdam
- 11 November 2005 SIKS-day 2005, Utrecht
- 23 November Symposium on Computer science and Law, Leiden
- 30 November 2005 IKAT-SIKS Symposium: The nature of representation, Maastricht
- 20 December 2005 Symposium on E-commerce and fair trade principles, Leiden

- SIKS-IKAT Research colloquium: organised 6 times in Maastricht
- CABS-SIKS Research colloquium, organised 6 times in Delft en Utrecht
- IKS-SIKS Information science seminar, organised 7 times in Utrecht

Activities 2006

Basic courses

"System modelling", May 29-31, 2006, Landgoed Huize Bergen, Vught
Course directors: Dr. P. van Eck (UT), Dr. W.-J. van den Heuvel (UvT)

"Knowledge modelling", May 31-June 02, 2006, Landgoed Huize Bergen, Vught
Course director: Dr. B. Bredeweg (UvA)

"Information and Organisation", September 25-27, 2006, Landgoed Huize Bergen, Vught
Course directors: Dr. H. Weigand (UvT), Prof.dr.ir. P. Grefen (TU/e)

"Architectures for IKS", September 27-29, 2006, Landgoed Huize Bergen, Vught
Course director: Prof.dr. E. Proper (RUN)

"Research methods and methodology for IKS", November, 20-21, 2006, Lunteren
Course directors: Dr. H. Weigand (UvT), Prof.dr. R. Wieringa (UT), Prof.dr. H. Akkermans (VUA)
Prof.dr. J.-J.Ch. Meyer (UU), Dr. R. Starmans (UU)

Advanced courses

"Computational Intelligence", April 03-04 2006, Landgoed Huize Bergen, Vught
Course directors: Dr. T. Heskes (RUN)

"Summer course on Datamining", July 03-07, 2006, Maastricht
Course directors: Dr. E. Smirnov (UM), Dr. J. Donkers (UM), Prof.dr. E.O. Postma (UM)

Other activities

- Theory Day 2006 of the NVTI, March 10, 2006, Utrecht
- Dutch Belgian Information Retrieval Workshop, March 13-14, 2006, Delft.
- SIKS Masterclass on Human-Computer Interaction, March 15, 2006, Amsterdam
- Workshop on Perceptual Cognition, April 20 2006, Maastricht
- SIKS Masterclass "Requirements Engineering & Information Modelling", May 30 2006 Amsterdam
- Workshop on Data modelling, June 06, 2006, Enschede
- Agent Systems summer school, EASSS 2006 17-21 Juli 2006, Annecy
- SIKS-conference on Enterprise Information Systems (EIS 2006), Sept 08, 2006, Utrecht
- BNAIC 2006, 05-06 October 2006, Namur
- Dutch-Belgian Database Day, November, 15-16 2006, Brussel
- SIKS-IKAT Research colloquium: organised 6 times in Maastricht
- CABS-SIKS Research colloquium, organised 8 times in Delft en Utrecht

Activities 2007

Basic courses:

"Learning and Reasoning", May 21-22, 2007, Landgoed Huize Bergen, Vught
Course directors: Dr. A. ten Teije (VUA), Dr. G.A.W. Vreeswijk (UU)

"Information Retrieval", May 23-24, 2007, Landgoed Huize Bergen, Vught
Course director: Prof.dr.ir. Th. van der Weide (RUN)

"Research methods and methodology for IKS", November 14-16, 2007, Vught
Course directors: Dr. H. Weigand (UvT), Prof.dr. R. Wieringa (UT), Prof.dr. H. Akkermans (VUA) Prof.dr. J-J.Ch. Meyer (UU), Dr. R. Starmans (UU)

"Agent Technology", December 10-11, 2007 , Landgoed Huize Bergen, Vught
Course directors: Prof.dr. C.M. Jonker (TUD), Prof.dr. J.-J.Ch. Meyer (UU), Prof.dr. B. De Schutter (TUD), Prof.dr. C. Witteveen (TUD).

Advanced courses:

"Computational Intelligence: AI and Probability", April 16-17 2007, Woudschoten, Zeist
Course director: Dr. T. Heskes (RUN)

"Summer course on Datamining", July 02-06, 2007, Maastricht
Course directors: Dr. E. Smirnov (UM), Dr. J. Donkers (UM), Prof.dr. E.O. Postma (UM)

"Service-oriented computing", October 04-05, 2007, Landgoed Huize Bergen, Vught
Course directors: Dr. H. Weigand (UvT), Dr. W.-J. van den Heuvel (UvT)

"Multi Agent Systems: Theory, Technology and Applications", December 12-13, 2007, Landgoed Huize Bergen, Vught (in collaboration with the Research School TRAIL)
Course directors: Prof.dr. C.M. Jonker (TUD), Prof.dr. J.-J.Ch. Meyer (UU), Prof.dr. B. De Schutter (TUD), Prof.dr. C. Witteveen (TUD).

Other activities:

- Conference: Benelearn 07, May 14-15, 2007, Amsterdam
- Conference: BNAIC 07, November 05-06, 2007, Utrecht
- Conference: Collective Intelligent Agents, September 19-21,2007, Delft
- Conference: Dutch-Belgian Database Day 2007 (DBDBD), Eindhoven
- Conference: DIR 2007, March 28-29, 2007, Leuven (BE)
- Conference: Enterprise Information Systems (EIS), June 26, 2007, Groningen
- Conference: 2nd Int. Conf. on the Pragmatic Web, October 22-23, 2007, Tilburg
- Doctoraal Consortium EIS, June 25, 2007, Groningen
- Masterclass: Norms and Institutions, June 25, 2007,Utrecht
- Masterclass: Towards a Science of the Semantic Web, February 05, 2007, Amsterdam
- NVTI Theory Day 2007, March 09, 2007, Utrecht
- SIKS-day 2007, May 04, 2007, Utrecht
- Seminar on Information Retrieval, November 01, 2007, Amsterdam
- Seminar on the Semantic Web, 11 April 2007, Utrecht
- SIKS-Agent Colloquia (9 times), Utrecht/Delft/Amsterdam
- SIKS-IKAT colloquia (5 times), Maastricht
- SIKS-UU seminars on Cognition (2 times) Utrecht
- Summerschool DECOI, August 20-24, 2007, Amsterdam
- Summerschool EASSS 2007, August, 27-31, 2007, Durham (UK)
- Symposium: Human Computer Interaction, November 23, 2007, Amsterdam

- Symposium: Intelligent Systems, October 12, 2007, Maastricht
- Symposium: Logic and Cognition, June 01, 2007, Groningen
- Symposium: Situated Models of Cognition and Perception, September 19, 2007, Maastricht
- Tutorial Program SIGIR, July 23-27, 2007, Amsterdam
- Winterschool Ten Competence, January 22-26, 2007, Innsbruck
- Workshop on Computer Games, June 15-17, 2007, Amsterdam
- Workshop Machine Learning for Natural Language Processing, May 16, 2007, Amsterdam
- Workshop: Latent Semantic Analysis, March 29-30, 2007, Heerlen
- Workshop: Value Modelling, January 18-19, 2007,Tilburg

Activities 2008

(NOTE: partial, as known on 21 April 2008)

Basic courses:

"Interactive Systems", May 19 - 20, 2008, NH Hotel, Best
Course director: Prof.dr. P. De Bra (TU/e), Prof.dr. G. van der Veer (VUA/OU)

"Combinatory Methods", May 21-22, 2008, NH Hotel, Best
Course director: Dr. N. Roos (UM)

"Research methods and methodology for IKS", 24-25-26 November, 2008, Zeist
Course directors: Dr. H. Weigand (UvT), Prof.dr. R. Wieringa (UT), Prof.dr. H. Akkermans (VUA)
Prof.dr. J.-J.Ch. Meyer (UU), Dr. R.J.C.M. Starmans (UU).

"Formal methods for IKS", December, 2008, Landgoed Huize Bergen, Vught
Course directors: Prof.dr. E.O. Postma (UM), Prof.dr. J.-J.Ch. Meyer (UU)

"Knowledge modelling", December, 2008, Landgoed Huize Bergen, Vught
Course director: to be announced.

Advanced courses:

"Engineering Web-based Systems: a semantic perspective", March 03-04 2008, Landgoed Huize Bergen, Vught.
Course directors: Prof.dr. G.-J. Houben (TUD), Dr. S. Schlobach (VUA)

"Summer course on Datamining", July 2008, Maastricht
Course directors: Dr. E. Smirnov (UM), Prof.dr. E.O. Postma (UM)

"Computational Intelligence", October 23 en 24, 2008, Woudschoten, Zeist
Course director: Prof.dr. A.P.J.M. Siebes (UU), Dr. U. Kaymak (EUR)

"Business Process Management", November 06-07, 2008, Landgoed Huize Bergen, Vught
Course directors: Prof.dr.ir. W. van der Aalst (TU/e), Prof.dr. M. Reichert (Univ. Ulm)

Other activities:
- Conference: Benelearn 08, May 19-20, 2008, Spa (Belgium)
- Conference: BNAIC 08, October 30-31, 2008, Enschede
- Conference: Dutch-Belgian Database Day 2008 (DBDBD), October 2008, Namur (Belgium)
- Conference: DIR 2008, April 14-15, 2008, Maaastricht

- Conference: Enterprise Information Systems (EIS), May 22-23, Tilburg
- Masterclass: Ontology-Driven conceptual modelling with applications, March 04-05, 2008, Enschede
- NVTI Theory Day 2007, March 14, 2008, Utrecht
- SIKS-day 2008, October 02, 2008, Utrecht
- Seminar on the Semantic Web, 09 April 2008, Utrecht
- SIKS-Agent Colloquia (8 times), Utrecht/Delft/Amsterdam
- SIKS-IKAT colloquia (8 times), Maastricht
- Summerschool EASSS 2008, May, 05-09, 2008, Lisbon (Portugal)
- Symposium: The Dynamics of Knowledge and Interpretation, April 12, 2008, Nijmegen
- Workshop: Agent Based approaches in Economics, January 24, 2008, Rotterdam.

(Note: date of completion of this list: 21 April 2008)

APPENDIX B: Some trends in funding IKS Research in The Netherlands

(Note: an earlier version of this appendix was published in the BNVKI Newsletter, 2006)

Some Trends in Funding IKS Research

By Richard Starmans (UU, Managing Director of SIKS)

Introduction
Monitoring trends in computer science research need not exclusively be limited to identifying research themes or topics, performing citation analyses, or measuring and analyzing scientific output. Scrutinizing science will not yield a fully-fledged picture without considering the external environment in which the research process takes place: its institutions, stakeholders and their interests and roles, including different ways of funding. How does this environment impinge on the current state of affairs (current research population, perceived scientific or societal relevance of certain research themes, etc)? Or, more modestly, how do research areas of interest differ with respect to certain characteristics of this environment that are considered important or problematic by some of these stakeholders? Dealing with these issues may not only result in a more thorough understanding and assessment of the current state of affairs in a research area, it may also facilitate policy makers and researchers to better anticipate on coming developments, both opportunities and threats. Regarding the research environment of computer science we start with three rather uncontroversial observations.

First and foremost, we have witnessed in the last decade an increasingly complex research environment with respect to institutions organising the research and/or providing the financial means to conduct it. In their “Assessment of Research Quality in Computer Science” (2004) QANU, on behalf of VSNU, outlined several initiatives such as the national research agenda NOAG-i (2001), the start of BSIK consortia, special interest programs of NWO and the FP framework of the EU. In the meantime NOAG-ICT (2005) has been launched, the Open Competition gained more significance as well as many thematic programs from NWO; new BSIK consortia were established, financed by the revenues of the Dutch national gas reserves and the sixth and seventh framework programs of the EU came into play. This list could easily be extended with initiatives like SMARTMIX, GATE and more. And, for the near future, the current Dutch government is expected to transfer substantial amounts of money from the first into the second money flow. Be this as it may, the plethora of funding programs or opportunities, often based on (international) competitions, makes finding and acquiring these means all the time more an area of expertise in its own right, and even triggered the founding of small commercial agencies offering their services to the research community.

A second characteristic of the field is that computer science, not unlike most of the exact sciences, finds it increasingly hard to get Dutch students interested to step into a four years PhD track. For a part this is due to the fact that graduates find more attractive employers, immediately after their graduation, rather easily. For another part, it can be explained by the small numbers of graduates in certain disciplines. As a result, in some exact disciplines the majority of the PhD research is actually being conducted by foreign PhD students, who visit the Netherlands for four years, and often return once having obtained their PhD.

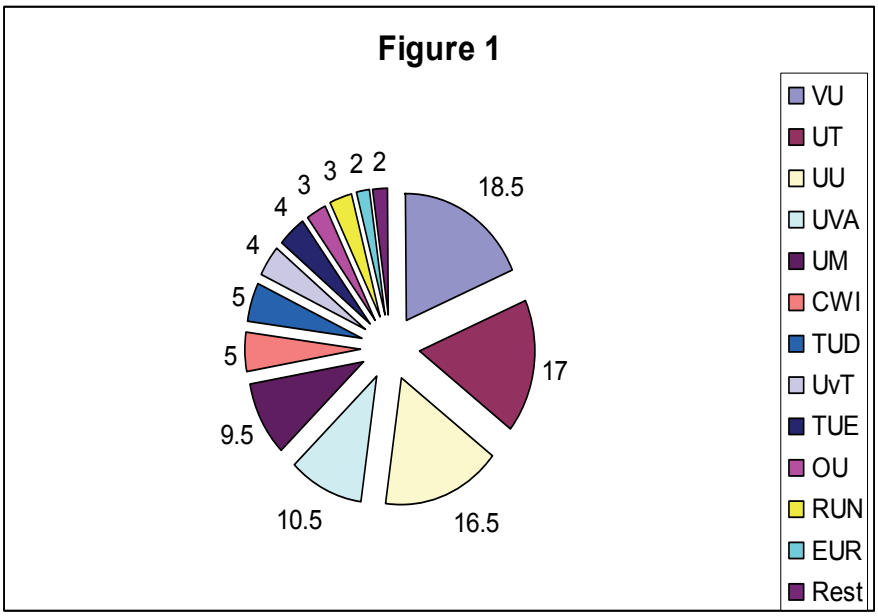
Thirdly, in many exact or technical sciences, including computer science, female researchers typically are strongly underrepresented. Despite a long tradition of governmental promotion in encouraging women to get enrolled into the exact sciences, the share of women in the student populations is often hardly ten or fifteen percent. To which extent this situation should be considered problematic or calls for immediate and stronger measures, is a matter of opinion of course, but considering the small numbers of female students finishing their masters in the exact or technical sciences, one can hardly expect the population of PhD students in physics, chemistry, mathematics or computer science to show a more balanced picture.

Aim

In this paper, we confine ourselves to PhD research in Information and Knowledge systems (IKS) and in Artificial Intelligence (AI). The latter is here considered to be a subset of the former. The main aim is to find out if and to what extent the aforementioned characteristics are recognisable in and relevant for the IKS field in general and the AI field in particular. To this end we studied project data of over 375 IKS research projects, all conducted between 1998 and 2007, or currently being conducted in the Netherlands by PhD students participating in the Netherlands Research School for Information and Knowledge Systems (SIKS). Data were provided by the administrative offices of the participating universities and were enriched with data obtained from the SIKS monitor, a large scale continuous survey among the PhD researchers, providing information on the research profiles of all individual researchers and the structure of the IKS field in the Netherlands. Among other things we registered for each project:

- on which formal money flows the project was based;
- which stakeholders / third parties were involved and how;
- how the research funding was acquired (internal, external competition, no competition, other allocation mechanisms);
- what financial conditions applied to the research project (matched funding, co-funding).

The population we studied is not the complete representation of the entire IKS research in the Netherlands, but sufficiently large for our exploratory purposes. Figure 1 provides a so-called "exploded pie-chart", that should be read clockwise to be in accordance with the legend. It shows the relative importance of the universities in the population.



Given the chosen objective and the population, we try to answer the following five questions:

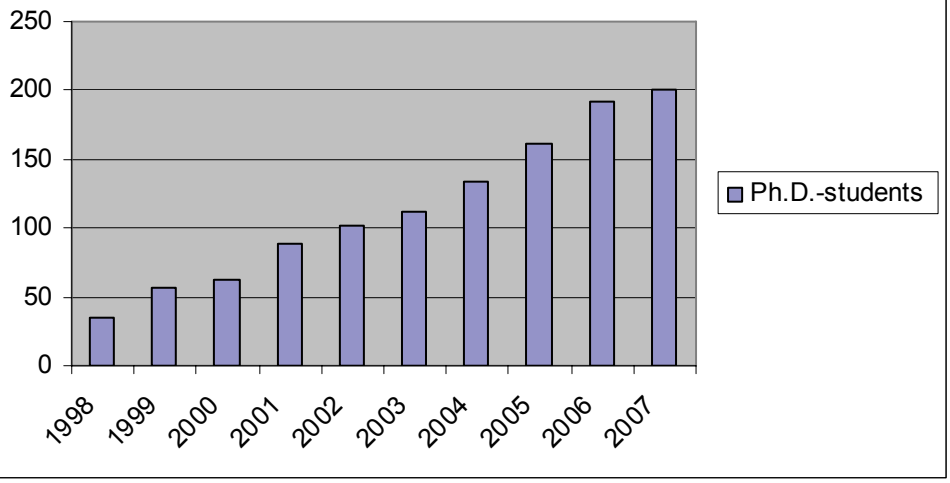
- In what way could IKS research in general and AI research in particular benefit from the increase of funding money in the period 1998-2007?
- In what way did IKS research in general and AI research in particular depend on first, second and third money flows in the period 1998-2007?
- In what way did IKS research in general and AI research in particular depend on funding from the European Commission in the period 1998-2007?
- How did the research population look like in the period 1998-2007 with respect to the relative proportions of Dutch and foreign researchers?

- How did the research population look like in the period 1998-2007 with respect to the relative share of male and female researchers?

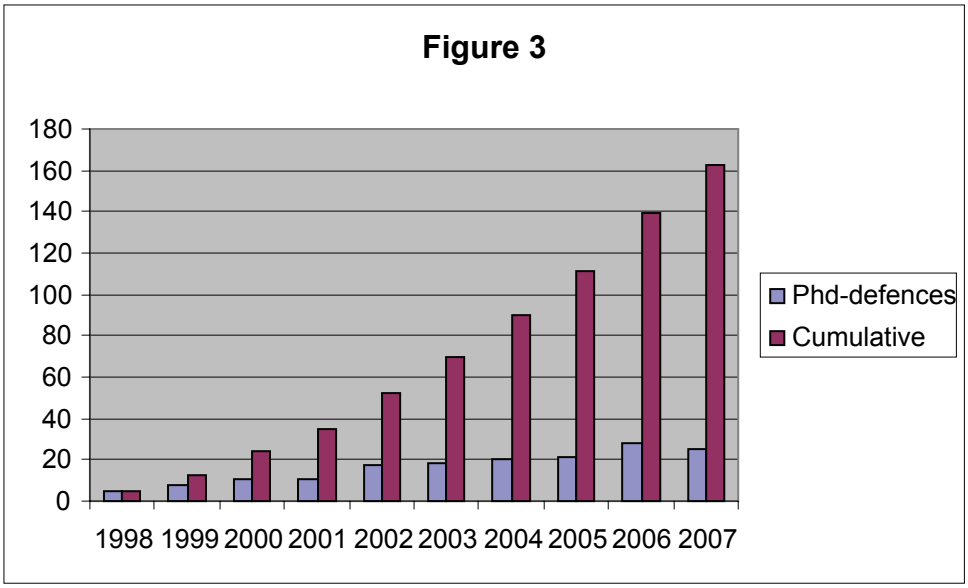
The period of ten years does enable us to establish some trends and look for significant differences over the years. Therefore, nearly all frequencies and percentages we provide are based on input cohorts; that is, they are based on new projects entering the SIKS School in each specific year.

Main results
In this short paper we will only provide some straightforward and general conclusions for the IKS field and AI research and compare them with earlier findings reported in (Starmans and Meyer, 2006). First and foremost, research in IKS flourishes, witnessing a spectacular growth of PhD projects and completed dissertations. Figure 2 shows a strong increase of IKS research projects conducted at Dutch universities in the last decade. The chart is based on the average number of registered PhD students per year. Even if we acknowledge that the IKS field might be somewhat underrepresented in our data with respect to the late nineties, this will not brush away the strong rise of the last five years. Starting with 35 PhD students in 1998, currently over 200 PhD researchers are conducting IKS research. The real rise in projects started in 2001 but has stopped in 2007 and it seems the population has stabilised in 2008.

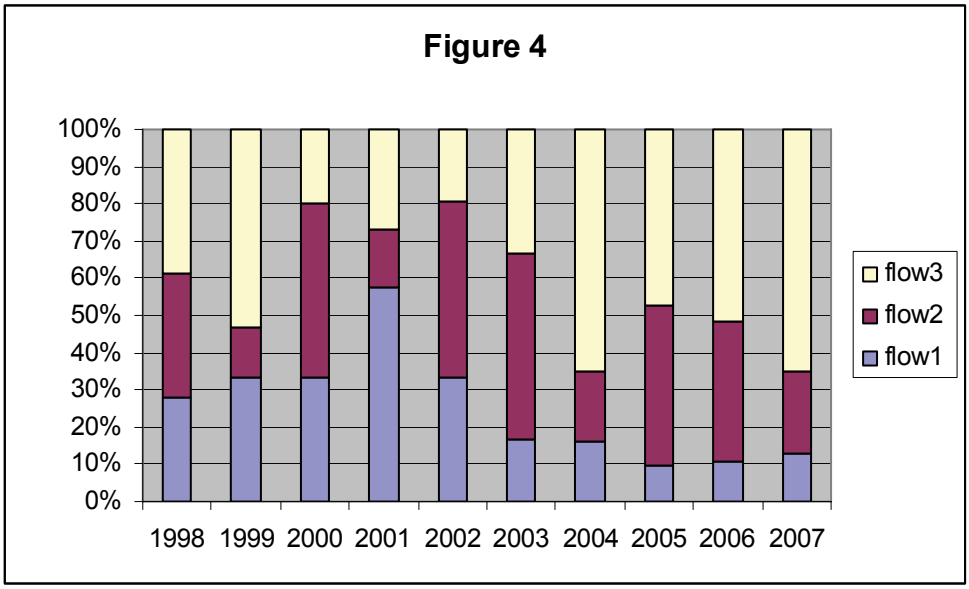
Figure 2



With a time delay of 4 to 5 years, the effects are visible in the number of successfully defended dissertations, displayed in Figure 3.



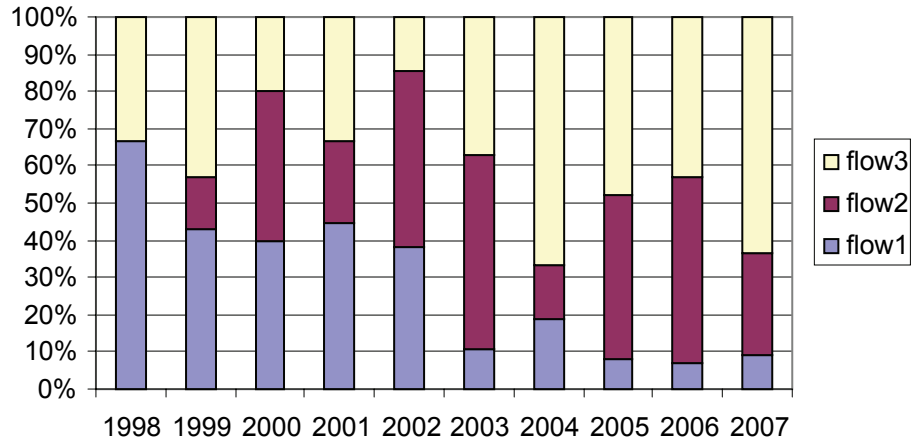
Obviously, this rise in projects is only possible with a substantial raise of funding sources, which we sketched earlier. We tracked the relative importance of the three money flows over a period of ten years, resulting in the stacked bar charts of Figure 4 and Figure 5, which for our purposes are quite illustrative. Both are based on input-cohorts, representing the new projects, starting in a particular year. Unlike Figure 2 they are not based on the average number of registered PhD students per year, representing the "actual population", which would here serve as an unwanted "moving-average", hiding the yearly fluctuations in the different types of funding.
Figure 4 deals with the entire IKS field and shows a dramatic decrease in first money flow financed projects over the last few years.



It dropped from nearly 60% in 2001 to only 10% in 2005. A closer look at the data confirms that this trend is only slightly attributable to the rise in second and third money flow projects. Also the absolute numbers confirm that universities more and more do not spend their first money flow resources to fund PhD research. This applies to the entire IKS field, but as Figure 5 points out even stronger to the AI field where the percentage new projects funded by first money flow was less than ten percent for three years in a row. In 2007 this decline has stopped. It stabilised at 12 % for IKS research and nearly 10% for AI research. Figure 4 and 5 also show considerable fluctuations in NWO funding, but in general the share of second money flow funding appears rather stable and we should not overrate the significance of the decline in 2007. The growth of

NWO and STW funded research is proportional to the growth of the population of all projects. So, combining Figure 2 and Figure 4 we can infer that the absolute growth of second money flow funding has stopped, but its share is quite substantial! Currently, this share is 35%.

Figure 5



It also appears that in the second money flow, there are relatively few STW financed projects; the vast majority is fully NWO funded. Restricting ourselves to the last five years, we observe that in the second money flow IKS research depends heavily on

- The Open competition
- Personal programs (VIDI, VICI, in the recent past: PIONIER)
- Special interest programs like TOKEN (Toegankelijkheid en Kennisontsluiting in Nederland), CATCH (Continuous Access To Cultural Heritage), JACQUARD (Joint Academic and Commercial Quality Research and Development in Software Engineering), CLS (Computational Life Sciences).

A closer look at the data shows a noticeable difference with earlier findings reported in (Starmans and Meyer, 2006). Several special interest programs which were highly relevant for IKS research have stopped or do not finance new projects anymore, which for the main part explains the decline in second money flow funding in 2007.

Regarding the observed increase of third money projects, Figure 6 (IKS field) and Figure 7 (AI field) show that this rise is not due to participation in European projects. This funding source plays a very modest role, especially in AI research. The rise we observed in 2006 does not seem to sustain today.

Figure 6

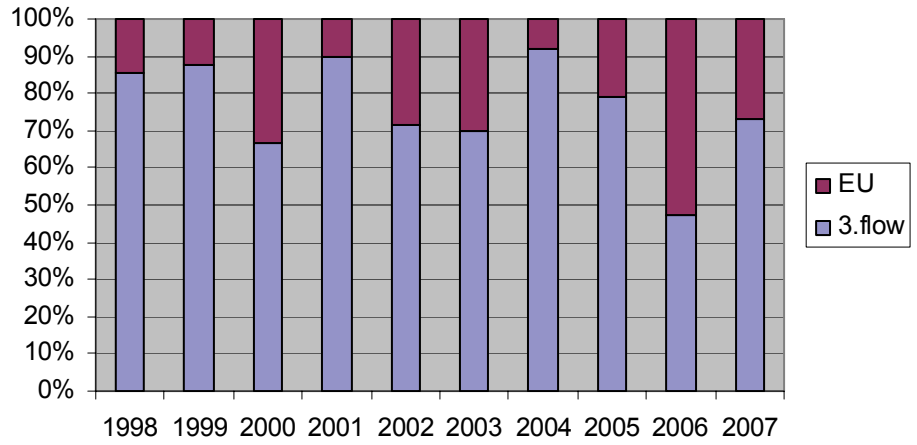
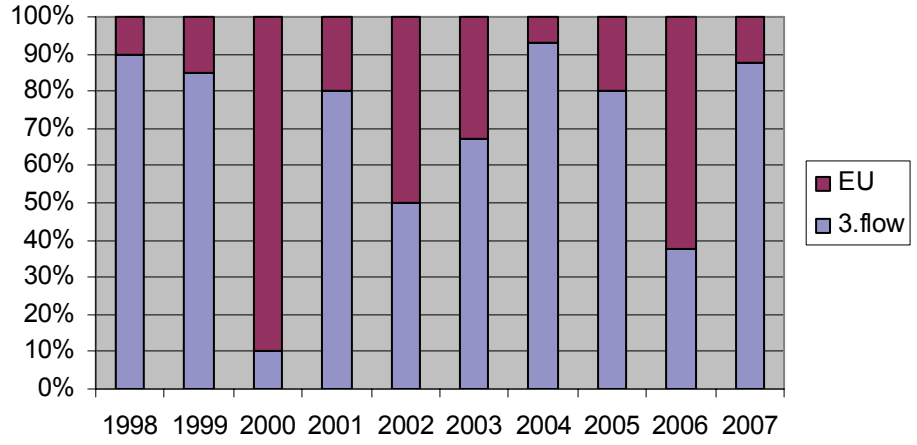


Figure 7



Interestingly, the rise of third money flow based projects is not caused by cooperation between research groups and individual companies either. Contract research, based on bilateral agreements between a company and a research group c.q. researcher as to financing PhD research is hardly manifest in the IKS field and AI field as represented by our data. A closer look at the data shows that the real impulse to third money flow funded PhD research is due to the start of the BSIK consortia.
In 2003, an ambitious program to finance investments in knowledge infrastructure (BSIK) was created. The BSIK scheme aims to bring together parties from public research and industry into BSIK consortia and support their joint research efforts with funding of up to 50 percent. A total budget of EUR 802 million is available for research proposals focusing on one of five multidisciplinary themes, which are considered to be highly relevant for the economy and the Dutch society as a whole: information and communication technology is one of these themes.

In fact the following four BSIK consortia substantially triggered the rise of third money in the last 5 years: BRICKS (Basic Research in Informatics for Creating the Knowledge Society), ICIS (Interactive Collaborative Information Systems), MULTIMEDIAN (Multimedian Netherlands) and BIORANGE (Bioinformatics).

However, in 2007 it appeared that these sources are drying up and the relatively strong position of third money flow is actually due to other programs, including SMARTMIX, GATE and subsidiary programs from foreign countries, allowing their students to do a PhD research in Europe.

With respect to the influence of foreign PhD students in the IKS field, Figure 8 shows a remarkable stability over the years. Small fluctuations in the subsequent input cohorts result in a percentage of about 55% of Dutch students over a long sequence of years. So the strong increase in money and projects did not reduce the share of Dutch students in IKS research. Only in 2006 the number of new foreign students exceeded the number of new Dutch students. Figure 9 depicts the AI-field and shows stronger fluctuations, but the overall picture is quite similar.

Figure 8

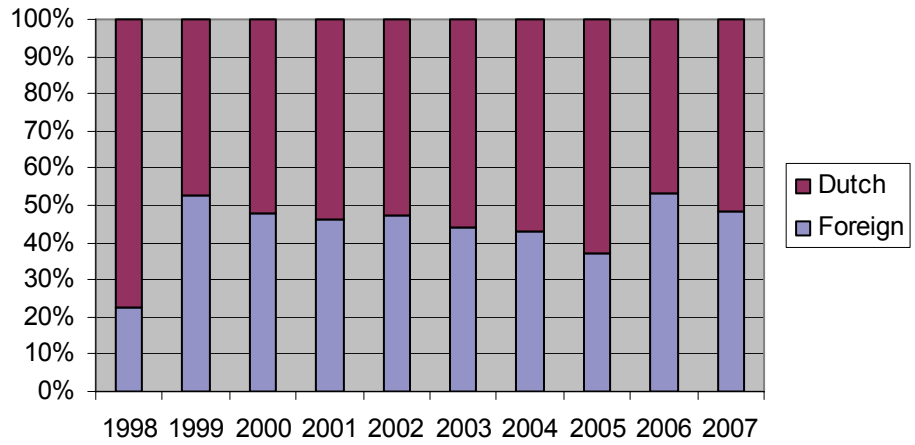
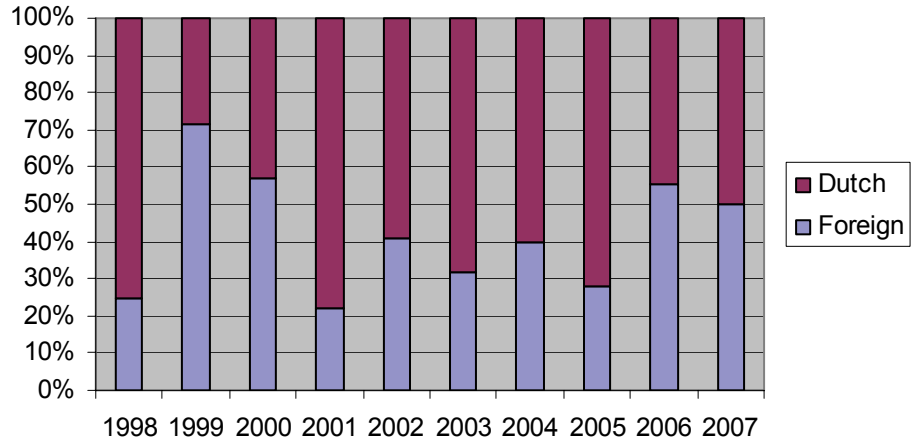
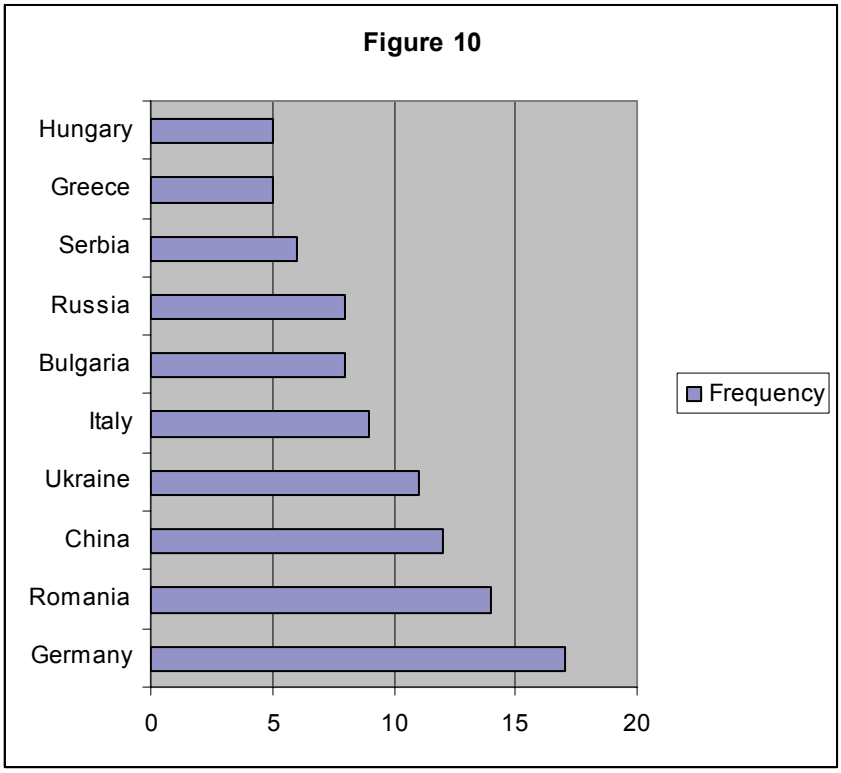


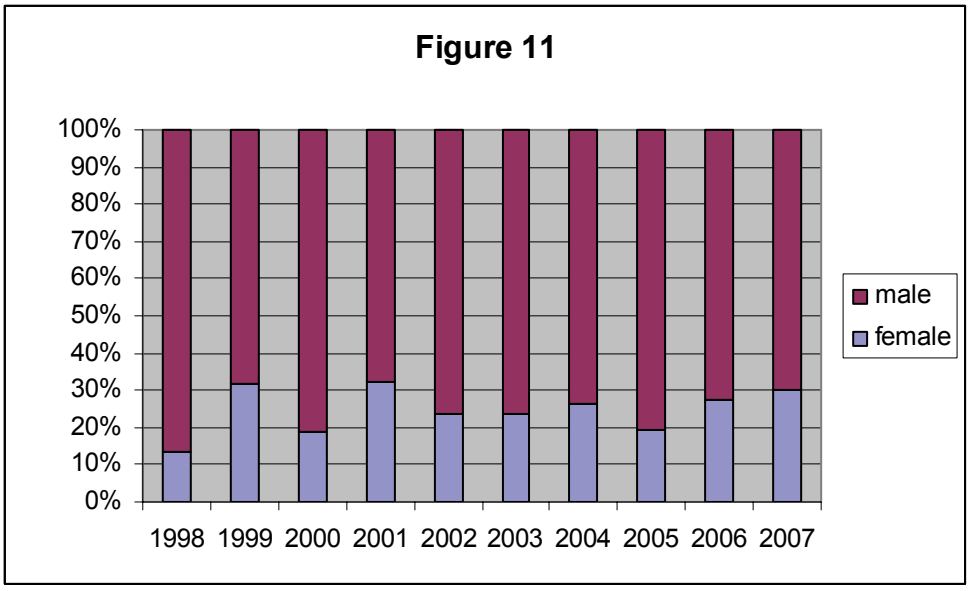
Figure 9



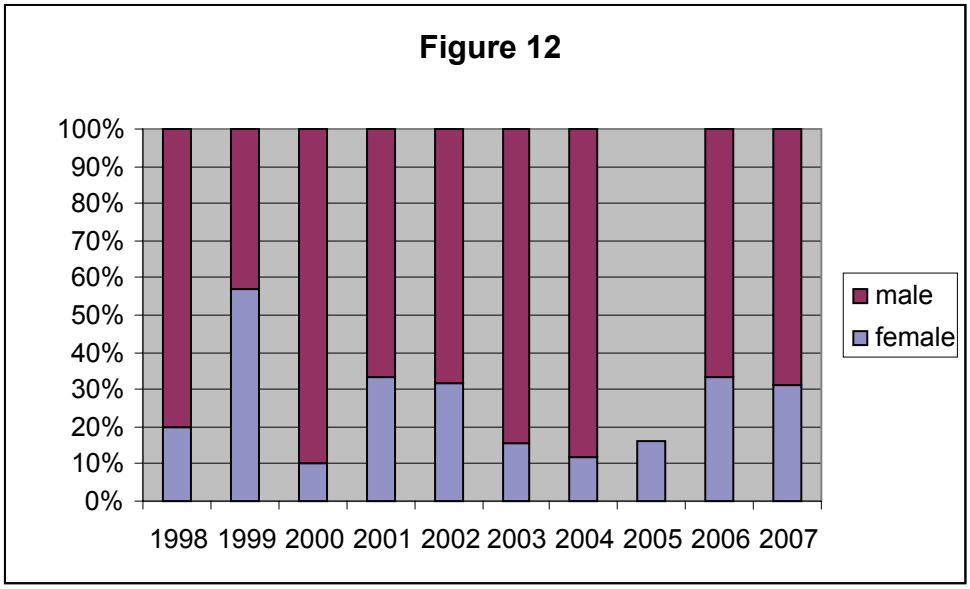
In the last couple of years we counted over 40 different nationalities in our research population, originating from all continents. Figure 10 shows the top-10 of foreign countries, bringing in PhD students into the Dutch IKS field and comprising about 65% of all foreign students in our population.



Finally, we will have a quick look at the relative share of female researchers in SIKS PhD research. Figure 11 and Figure 12 show the distributions for the IKS field and the AI field respectively.



In the IKS field the share of female researchers ranges from 20 to 25 percent for many years; without a doubt an altogether different picture from what we generally in the exact sciences. With respect to gender differences in AI we saw a decline of new female students with a minimum of 12% in 2004, but a substantial improvement in 2006 and 2007 with percentages over 30%. However, it is noted that these rather high percentages in IKS research and AI research are for the main part due to female foreign students entering the SIKS School.



In fact, in the female IKS population, the percentage of foreign students is 58%. In the AI field this is even stronger: nearly seven out of ten female AI PhD students is from abroad.

Conclusions

In 2008 the general picture regarding research funding in IKS research reconfirms some of the trends established in Starmans and Meyer (2006) with a few interesting adjustments. First and foremost, we observe an impressive growth of PhD projects and finished dissertations, but for the main part this research is based on *non-structural* funding. The drastic decline of first money flow that started 5 years ago now stabilises in 2008. In AI it didn't even reach 10% for three cohorts in a row.

With respect to NWO funding, we notice strong fluctuations between cohorts which are confirmed by the absolute numbers, but over the last six years the growth is proportional to the growth of the population. A little worrisome is the fact that several successful programs, which caused the high share of second money flow projects thus far, have ended or at least do not bring in new projects. Continuation in the next period is not guaranteed.

The noticeable raise of third money flow is not caused by funding programs of the EU. The increase observed in 2006 doesn't seem to sustain. In AI research its influence is hardly worth mentioning. Evidently, the strong position of third money flow is not caused by contract research between a company and a research group or researcher either. Bilateral agreements as to financing PhD research are hardly manifest in IKS and AI. The BSIK consortia are for the main part responsible for the strong position of third money funding. However, the absolute numbers show that several highly successful programs have now nearly dried up.

Of course, there are some obvious concerns with respect to third money projects. Unlike first money research, they have several stakeholders and they tend to favour more applied research. And, they often demand matched funding, which means that faculties, in order to meet this financial prerequisite, temporally buy out their permanent staff, to supervise and participate in the more applied third money flow projects. So the rise in third money flow may occur at the expense of first money stream research.

Furthermore, the third money flow projects depend heavily on the economic situation and there is no guarantee that BSIK consortia (or its successors) will be continued at the same level in the next years. Programs like SMARTMIX or GATE are important, but not sufficient to compensate for the established trends. Very recent successes from the seventh framework programme of the EU and

the new Jacquard program “Software as Service” have been reported (late 2007/2008), but the results are not recognisable in the data yet.

In IKS research Dutch PhD students make up about 55% of the SIKS population. Germany, China, but especially Romenia and other Eastern European countries are the main sources of research immigration. The fraction of female PhD students in IKS research ranges between 20-25 percent, showing a different picture than the general one in the exact sciences. However, this rather high percentage is for the main part caused by female foreign students.

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QANU, (2004) Assessment of Research Quality in Computer Science, May 2004

APPENDIX C: Key publications of SIKS Groups 2003-2008

To give an impression of the research done in the Netherlands and of its contribution to the international field of Information and Knowledge Systems, a list of key publications from the participating SIKS groups over the reporting period 2003-2008 follows below.
(End date: March 2008).

Please note that these are selected SIKS publications only. For each SIKS research group a selection with a maximum of ten publications has been listed.

VU University Amsterdam (VUA)

Business Informatics Group (VUA)

Research leader: Prof.dr. J.M. Akkermans

Gordijn, J. and Akkermans, H., Value based requirements engineering: Exploring innovative e-commerce ideas. Requirements Engineering Journal, Vol. 8(2):114-134, 2003.

Mika, P.: Ontologies are us: A unified model of social networks and semantics, J. Web Semantics 5 (2007) 5-15. Award-winning research at the Int. Semantic Web Conference, ISWC-2004 (winner Semantic Web Challenge 2004) and ISWC-2005 (best paper)

Gordijn,J., Yu, E. and Van der Raadt, B., e-Service Design Using i* and e3value Modeling. IEEE Software, Vol. 23(3):26-33, May 2006.

Akkermans, H., Baida, Z., Gordijn, J., Peña, N., Altuna, A., Laresgoiti, I., Value Webs: Ontology-Based Bundling of Real-World Services. IEEE Intelligent Systems, Vol. 19(4):57—66, July 2004.

Gordijn, J. and Akkermans, H., Business Models for Distributed Energy Resources In a Liberalized Market Environment. The Electric Power Systems Research Journal, Vol. 77(9):1178–1188, Elsevier, 2007.

Akkermans, H. and Gordijn, J., What is this Science called Requirements Engineering? In Glinz, M. and Lutz, R. editors, Proceedings of the 14th IEEE International Requirements Engineering Conference, Pages 273-278, IEEE CS, Los Alamitos, CA, 2006.

Mika, P. and Akkermans, H., Towards a New Synthesis of Ontology Technology and Knowledge Management. Knowledge Engineering Review 19 (4), 317-345, 2004.

Baida, Z., Gordijn, J., Akkermans, H., Saele, H. and Morch, A.Z., Finding e-Service Offerings by Computer-supported Customer Need Reasoning. International Journal of E-Business Research (IJEBR), Vol. 1(3):91-112, 2005.

Kartseva, V., Gordijn, J. and Tan, Y.-H., Towards a Modelling Tool for Designing Control Mechanisms in Network Organisations. International Journal of Electronic Commerce, Vol. 10(2):57—84, 2005.

Pijpers, V. and Gordijn, J., e3forces : Understanding Strategies of Networked Value Constellations by Analyzing Environmental Forces. In Krogstie, J., Opdahl, A. and Sindre, G., editors, 19th International Conference, CAiSE 2007, Trondheim, Norway, June 2007, Proceedings, Vol. 4495:188-202 of LNCS, Springer Verlag, 2007.

Interactive and Distributed Systems Group (VUA)

Research leader: Prof.dr. F. Brazier

Warnier, M., Brazier, F. M. T. and Oskamp, A., Security of Distributed Digital Criminal Dossiers, in: Journal of Software (Academy Publisher), volume 2, number 6, 2007.

Haydarlou, A.R., Overeinder, B. J., Oey, M. A. and Brazier, F. M. T., Multi-Level Model-Based Self-Diagnosis of Distributed Object-Oriented Systems, in: Proceedings of the 3rd IFIP International Conference on Autonomic and Trusted Computing (ATC-06), 2006.

Van Splunter, S., van Langen, P. H. G. and Brazier, F. M. T., The Role of Local Knowledge in Complex Web Service Reconfiguration, in: Proceedings of the 2005 IEEE/WIC International Conference on Web Intelligence (WI 2005), Compiegne, France, pages 495-499, IEEE, 2005.

Mobach, D. G. A., Overeinder, B. J. and Brazier, F. M. T., A WS -Agreement Based Resource Negotiation Framework for Mobile Agents, in: Scalable Computing: Practice and Experience, volume 7, number 1, pages 23-36, 2006.

Overeinder, B. J., Oey, M. A., Timmer, R. J., van Schouwen, R, Rozendaal, E. and Brazier, F. M. T., Design of a Secure and Decentralized Location Service for Agent Platforms, in: Proceedings of the Sixth International Workshop on Agents and Peer-to-Peer Computing (AP2PC 2007), Honolulu, Hawai'i, 2007.

Richards, D., van Splunter, S., Brazier, F. M. T. and Sabou, M., Composing Web Services using an Agent Factory, Multiagent Systems, Artificial Societies, and Simulated Organiza, volume 13, pages 229-252, Springer, 2005.`

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Ogston, E., van Steen, M. and Brazier, F. M. T., Group Formation Among Decentralized Autonomous Agents, in: Applied Artificial Intelligence, pages 953-970, 2004.

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Wijngaards, N. J. E., Overeinder, B. J., van Steen, M. and Brazier, F. M. T., Supporting Internet-Scale Multi-Agent Systems, in: Data and Knowledge Engineering, volume 41, number 2-3, pages 229-245, 2002.

Computational Intelligence Group (VUA)
Research leader: Prof.dr. A.E. Eiben

Eiben, A.E. and Jelasity, M. A Critical Note on Experimental Research Methodology in EC, In Proceedings of the 2002 Congress on Evolutionary Computation (CEC 2002), 582-587, IEEE Press, 2002.

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Knowledge Representation and Reasoning Group (VUA)
Research Leader: Prof.dr. F.A.H. van Harmelen

Antoniou, G. and van Harmelen, F.A.H., A Semantic Web Primer. MIT Press, Cambridge, Ma., 2004.

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Intelligent Information Systems Group (VUA)

Research leader: Prof.dr. A.Th. Schreiber

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Agent Systems Research Group (VUA)

Research leader: Prof.dr. J. Treur

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Research leader: Prof.dr. L. Hardman

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2004-13
Wojciech Jamroga (UT)
Using Multiple Models of Reality: On Agents who Know how to Play
Promotores: Prof.dr.ir. A. Nijholt (UT), Prof.dr. W. van der Hoek (University of Liverpool)
Co-promotor: Dr. J. Zwiers (UT)
Public Defense: 01 July 2004

2004-14
Paul Harrenstein (UU)
Logic in Conflict – Logical Explorations in Strategic Equilibrium
Promotores: Prof.dr. J.-J. Ch. Meyer (UU), Prof.dr. W. van der Hoek (University of Liverpool)
Co-promotor: Dr. C. Witteveen (TUD)
Public Defense: 06 September 2004

2004-15
Arno Knobbe (UU)
Multi-Relational Data Mining
Promotor: Prof.dr. A.P.J.M. Siebes (UU)
Public Defense: 22 November 2004

2004-16
Federico Divina (VUA)
Hybrid Genetic Relational Search for Inductive Learning
Promotor: Prof.dr. A.E. Eiben (VUA)
Co-promotor: Dr. E. Marchiori (VUA)
Public Defense: 26 October 2004

2004-17
Mark Winands (UM)
Informed Search in Complex Games
Promotor: Prof.dr. H.J. van den Herik (UM)

Co-promotor: Dr. J.W.H.M. Uiterwijk (UM)
Public Defense: 01 December 2004

2004-18
Vania Bessa Machado (UvA)
Supporting the Construction of Qualitative Knowledge Models
Promotor: Prof.dr. B.J. Wielinga (UvA)
Co-promotor: Dr. B. Bredeweg (UvA)
Public Defense: 29 November 2004

2004-19
Thijs Westerveld (UT)
Using generative probabilistic models for multimedia retrieval
Promotor: Prof.dr. F.M.G. de Jong (UT)
Co-promotor: Dr.ir. A.P. de Vries (CWI)
Public Defense: 25 November 2004

2004-20
Madelon Evers (Nyenrode)
Learning from Design: facilitating multidisciplinary design teams
Promotores: Prof.dr. W. Baets (Nyenrode), Prof.dr. G. van der Veer (VUA)
Co-promotor: Dr. Th. Homan (Nyenrode)
Public Defense: 10 December 2004

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2005
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2005-01
Floor Verdenius (UvA)
Methodological Aspects of Designing Induction-Based Applications
Promotor: Prof.dr. B.J. Wielinga (UvA)
Copromotor: Dr. M.W. van Someren (UvA)
Public Defense: 28 January 2005

2005-02
Erik van der Werf (UM)
AI techniques for the game of Go
Promotor: Prof.dr. H.J. van den Herik (UM)
Co-promotor: Dr. J.W.H.M. Uiterwijk (UM)
Public Defense: 27 January 2005

2005-03
Franc Grootjen (RUN)
A Pragmatic Approach to the Conceptualisation of Language
Promotores: Prof.dr.ir. Th.P. van der Weide (RUN), Prof. C.H.A. Koster (RUN)
Public Defense: 26 January 2005

2005-04
Nirvana Meratnia (UT)
Towards Database Support for Moving Object data
Promotores: Prof.dr. P.M.G. Apers (UT)
Copromotor: Dr.ir. R.A. de By (ITC)
Public Defense: 23 February 2005

2005-05
Gabriel Infante-Lopez (UvA)
Two-Level Probabilistic Grammars for Natural Language Parsing

Promotores: Prof.dr. M. de Rijke (UvA), Prof.dr. R. Scha (UvA)
Public Defense: 06 April 2005

2005-06
Pieter Spronck (UM)
Adaptive Game AI
Promotores: Prof.dr. H.J. van den Herik (UM), Prof.dr. E.O. Postma (UM)
Public Defense: 20 May 2005

2005-07
Flavius Frasincar (TU/e)
Hypermedia Presentation Generation for Semantic Web Information Systems
Promotores: Prof.dr. P. De Bra (TU/e), Prof.dr.ir. G.-J. Houben (VUB/TU/e)
Co-promotor: Prof.dr. J. Paredaens (TU/e/UA)
Public Defense: 20 June 2005

2005-08
Richard Vdovjak (TU/e)
A Model-driven Approach for Building Distributed Ontology-based Web Applications
Promotores: Prof.dr. P. De Bra (TU/e), Prof.dr.ir. G.-J. Houben (VUB/TU/e)
Co-promotor: Prof.dr. J. Paredaens (TU/e/UA)
Public Defense: 20 June 2005

2005-09
Jeen Broekstra (VUA)
Storage, Querying and Inferencing for Semantic Web Languages
Promotor: Prof.dr. F. van Harmelen (VUA)
Public Defense: 04 July 2005

2005-10
Anders Bouwer (UvA)
Explaining Behaviour: Using Qualitative Simulation in Interactive Learning Environments
Promotores: Prof.dr. B. J. Wielinga (UvA), Prof.dr. J.A.P.J. Breuker (UvA)
Co-promotor: Dr. B. Bredeweg (UvA)
Public Defense: 06 July 2005

2005-11
Elth Ogston (VUA)
Agent Based Matchmaking and Clustering – A Decentralized Approach to Search
Promotores: Prof.dr. F.M.T. Brazier (VUA), Prof.dr.ir. M.R. van Steen (VUA)
Public Defense: 05 April 2005

2005-12
Csaba Boer (EUR)
Distributed Simulation in Industry
Promotor: Prof.dr. A. de Bruin (EUR), Prof.dr.ir. A. Verbraeck (Delft University/University of Maryland)
Public Defense: 21 Oktober 2005

2005-13
Fred Hamburg (UL)
Een Computermodel voor het Ondersteunen van Euthanasiebeslissingen
Promotores: Prof.dr. H.J.van den Herik (UM/UL), Prof.dr. H.M.Dupuis (UL), Prof.dr.E.O.Postma (UM)
Public Defense: 24 November 2005

2005-14
Borys Omelayenko (VUA)
Web-Service Configuration on the Semantic Web – Exploring how Semantics meets Pragmatics
Promotores: Prof.dr. A.Th. Schreiber (VUA), Prof.dr. J.M. Akkermans (VUA)
Public Defense: 12 October 2005

2005-15
Tibor Bosse (VUA)
Analysis of the Dynamics of Cognitive Processes
Promotores: Prof.dr. J. Treur (VUA), Prof.dr. C.M. Jonker (RUN)
Public Defense: 23 November 2005

2005-16
Joris Graaumans (UU)
Usability of XML Query Languages
Promotor: Prof.dr.ir. G.J. van der Steen (UU)
Co-promotor: Dr. H. van Oostendorp (UU)
Public Defense: 17 October 2005

2005-17
Boris Shishkov (TUD)
Software Specification Based on Re-usable Business Components
Promotor: Prof.dr.ir. J.L.G. Dietz (TUD)
Public Defense: 26 September 2005

2005-18
Danielle Sent (UU)
Test-selection strategies for probabilistic networks
Promotor: Prof.dr.ir. L. C. van der Gaag (UU)
Public Defense:17 October 2005

2005-19
Michel van Dartel (UM)
Situated Representation
Promotores: Prof.dr. E.O. Postma (UM), Prof.dr. H.J. van den Herik (UM)
Public Defense: 1 December 2005

2005-20
Cristina Coteanu (UL)
Cyber Consumer Law, State of the Art and Perspectives
Promotores: Prof.dr. H.J. van den Herik (UM), Prof.dr. G. Howells (Sheffield)
Public Defense: 20 December 2005

2005-21
Wijnand Derks (UT)
Improving Concurrency and Recovery in Database Systems by Exploiting Application Semantics
Promotor: Prof.dr. W. Jonker (UT)
Public Defense:16 November 2005

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2006
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2006-01
Samuil Angelov (TU/e)
Foundations of B2B Electronic Contracting
Promotores: Prof.dr.ir. P.W.P.J. Grefen (TU/e), Prof. dr. ir. J.A. La Poutré (TU/e/CWI)
Public Defense: 02 February 2006

2006-02
Cristina Chisalita (VUA)
Contextual issues in the design and use of information technology in organizations
Promotores: Prof.dr.G. van der Veer (VUA), prof. dr. J.C. van Vliet (VUA)
Public Defense: 14 March 2006

2006-03
Noor Christoph (UvA)
The role of metacognitive skills in learning to solve problems
Promotor: Prof.dr. B.J. Wielinga (UvA)
Co-promotor: Dr. J. Sandberg (UvA)
Public Defense: 21 April 2006

2006-04
Marta Sabou (VUA)
Building Web Service Ontologies
Promotores: Prof.dr. F.A.H. van Harmelen (VUA), Prof.dr. H. Stuckenschmidt (University of Mannheim)
Public Defense: 27 April 2006

2006-05
Cees Pierik (UU)
Validation Techniques for Object-Oriented Proof Outlines
Promotor: Prof.dr. J.-J. Ch. Meyer (UU)
Co-promotor: Dr. F.S. de Boer (UU/CWI)
Public Defense: 03 May 2006

2006-06
Ziv Baida (VUA)
Software-aided Service Bundling - Intelligent Methods & Tools for Graphical Service Modelling
Promotor: Prof.dr. J.M. Akkermans (VUA)
Co-promotor: Dr. J. Gordijn (VUA)
Public Defense: 29 May 2006

2006-07
Marko Smiljanic (UT)
XML schema matching – Balancing efficiency and effectiveness by means of clustering
Promotor: Prof.dr. W. Jonker (UT/Philips Research)
Co-promotor: Dr. M. van Keulen (UT)
Public Defense: 21 April 2006

2006-08
Eelco Herder (UT)
Forward, Back and Home Again – Analyzing User Behavior on the Web
Promotor: Prof.dr.ir. A. Nijholt (UT)
Assistent-Promotor: Dr. E.M.A.G. van Dijk (UT)
Public Defense: 13 April 2006

2006-09
Mohamed Wahdan (UM)
Automatic Formulation of the Auditor's Opinion
Promotores: Prof.dr. H.J. van den Herik (UM), Prof. E.H.J. Vaassen (UM)
Co-promotores: Prof. H.F. Ali (Rutherford University), Dr. P. Spronck (UM)
Public Defense: 29 June 2006

2006-10
Ronny Siebes (VUA)
Semantic Routing in Peer-to-Peer Systems
Promotor: Prof.dr. F.A.H. van Harmelen (VUA)
Public Defense: 09 June 2006

2006-11
Joeri van Ruth (UT)
Flattening Queries over Nested Data Types
Promotor: Prof.dr. P.M.G. Apers (UT)
Public Defense: 02 June 2006

2006-12
Bert Bongers (VUA)
Interactivation – Towards an e-cology of people, our technological environment, and the arts
Promotores: Prof.dr. G.C. van der Veer (VUA), Prof.dr. J.C. van Vliet (VUA)
Public Defense: 04 July 2006

2006-13
Henk-Jan Lebbink (UU)
Dialogue and Decision Games for Information Exchanging Agents
Promotores: Prof.dr. J.-J.Ch. Meyer (UU), Prof.dr. C.L.M. Witteman (RUN)
Public Defense: 18 September 2006

2006-14
Johan Hoorn (VUA)
Software Requirements: Update, Upgrade, Redesign – Towards a Theory of Requirements Change
Promotores: Prof.dr. G. C. van der Veer (VUA), Prof.dr. J. C. van Vliet (VUA)
Public Defense: 09 October 2006

2006-15
Rainer Malik (UU)
CONAN: Text Mining in the Biomedical Domain
Promotor: Prof.dr. A.P.J.M. Siebes (UU)
Public Defense: 11 October 2006

2006-16
Carsten Riggelsen (UU)
Approximation Methods for Efficient Learning of Bayesian Networks
Promotor: Prof.dr. A.P.J.M. Siebes (UU)
Co-promotor: Dr. A.J. Feelders (UU)
Public Defense: 23 October 2006

2006-17
Stacey Nagata (UU)
User Assistance for Multitasking with Interruptions on a Mobile Device
Promotor: Prof.dr. J. van den Berg (UU), Prof.dr. M. Neerincx (TUD)
Co-promotor: Dr. H. van Oostendorp (UU)
Public Defense: 12 October 2006

2006-18
Valentin Zhizhkun (UvA)
Graph transformation for Natural Language Processing
Promotor: Prof.dr. M. de Rijke (UvA)
Public Defense: 28 November 2006

2006-19
Birna van Riemsdijk (UU)
Cognitive Agent Programming: A Semantic Approach
Promotor: Prof.dr. J.-J. Ch. Meyer (UU)
Co-promotores: Dr. F.S. de Boer (CWI / LIACS / UU), Dr. M. Dastani (UU)
Public Defense: 25 October 2006

2006-20
Marina Velikova (UvT)
Monotone models for prediction in data mining
Promotores: Prof.dr.ir. H.A.M. Daniels (UvT/EUR), Prof.dr. J.P.C. Kleijnen (UvT)
Co-promotores: Dr. A.J. Feelders (UU)
Public Defense: 13 November 2006

2006-21
Bas van Gils (RUN)

Aptness on the Web
Promotores: Prof.dr. H.A. Proper (RUN), Prof.dr.ir. Th.P. van der Weide (RUN)
Public Defense: 08 December 2006

2006-22
Paul de Vrieze (RUN)
Fundaments of Adaptive Personalisation
Promotor: Prof.dr.ir. Th.P. van der Weide (RUN)
Co-promotores: Dr. P. van Bommel (RUN)
Public Defense: 13 December 2006

2006-23
Ion Juvina (UU)
Development of Cognitive Model for Navigating on the Web
Promotor: Prof.dr. J. van den Berg (UU)
Co-promotores: Dr. H. van Oostendorp (UU)
Public Defense: 19 October 2006

2006-24
Laura Hollink (VUA)
Semantic Annotation for Retrieval of Visual Resources
Promotores: Prof.dr. A.Th. Schreiber (VUA), Prof.dr. B.J. Wielinga (UvA)
Co-promotor: Dr. M. Worring (UvA)
Public Defense: 16 November 2006

2006-25
Madalina Drugan (UU)
Conditional log-likelihood MDL and Evolutionary MCMC
Promotor: Prof.dr.ir. L.C. van der Gaag (UU)
Co-promotor: Dr.ir. D. Thierens (UU)
Public Defense: 27 November 2006

2006-26
Vojkan Mihajlovic (UT)
Score Region Algebra: A Flexible Framework for Structured Information Retrieval
Promotor: Prof.dr. P.M.G. Apers (UT)
Co-promotor: Dr. D. Hiemstra (UT)
Public Defense: 07 December 2006

2006-27
Stefano Bocconi (CWI/TU/e)
Vox Populi: generating video documentaries from semantically annotated media repositories
Promotor: Prof.dr. L. Hardman (TU/e/CWI)
Co-promotor: Dr. F. Nack (CWI)
Public Defense: 30 November 2006

2006-28
Borkur Sigurbjornsson (UvA)
Focused Information Access using XML Element Retrieval
Promotor: Prof.dr. M. de Rijke (UvA)
Co-promotor: Dr.ir. J. Kamps (UvA)
Public Defense: 14 December 2006

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2007
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2007-01
Kees Leune (UvT)

Access Control and Service-Oriented Architectures
Promotor: Prof.dr.ir. M.P. Papazoglou (UvT)
Co-promotor: Dr. W.-J. van den Heuvel (UvT)
Public Defense: 28 February 2007

2007-02
Wouter Teepe (RUG)
Reconciling Information Exchange and Confidentiality: A Formal Approach
Promotor: Prof.dr. L.R.B. Schomaker (RUG)
Co-promotor: Dr. L.C. Verbrugge (RUG)
Public Defense: 18 January 2007

2007-03
Peter Mika (VUA)
Social Networks and the Semantic Web
Promotor: Prof.dr. J.M. Akkermans (VUA), Prof.dr. T. Elfring (VUA)
Co-promotor: Dr. P. Groenewegen (VUA)
Public Defense: 05 February 2007

2007-04
Jurriaan van Diggelen (UU)
Achieving Semantic Interoperability in Multi-agent Systems: a dialogue-based approach
Promotor: Prof.dr. J.-J. Ch. Meyer (UU)
Co-promotores: Dr.ir. R.-J. Beun (UU), Dr. F.P.M. Dignum (UU), Dr. R.M. van Eijk (UU)
Public Defense: 21 March 2007

2007-05
Bart Schermer (UL)
Software Agents, Surveillance, and the Right to Privacy: a Legislative Framework for Agent-enabled Surveillance
Promotor: Prof.dr. H.J. van den Herik (UM/UL)
Public Defense: 09 May 2007

2007-06
Gilad Mishne (UvA)
Applied Text Analytics for Blogs
Promotor: Prof.dr. M. de Rijke (UvA)
Public Defense: 27 April 2007

2007-07
Natasa Jovanovic (UT)
To Whom It May Concern - Addressee Identification in Face-to-Face Meetings
Promotor: Prof.dr.ir. A. Nijholt (UT)
Co-promotor: Dr.ir. H.J.A. op den Akker (UT)
Public Defense: 14 March 2007

2007-08
Mark Hoogendoorn (VUA)
Modeling of Change in Multi-Agent Organizations
Promotores: Prof. dr. J. Treur (VUA), Prof. dr. C.M. Jonker (TUD)
Public Defense: 18 June 2007

2007-09
David Mobach (VUA)
Agent-Based Mediated Service Negotiation
Promotor: Prof.dr. F.M.T. Brazier (VUA)
Co-promotor: Dr. B.J. Overeinder (VUA)
Public Defense: 21 May 2007

2007-10
Huib Aldewereld (UU)

Autonomy vs. Conformity: an Institutional Perspective on Norms and Protocols
Promotor: Prof.dr. J.-J. Ch. Meyer (UU)
Co-promotor: Dr. F.Dignum (UU)
Public Defense: 04 June 2007

2007-11
Natalia Stash (TU/e)
Incorporating Cognitive/Learning Styles in a General-Purpose Adaptive Hypermedia System
Promotores: Prof.dr. P.M.E. de Bra (TU/e), Prof.dr. L. Hardman (CWI /TU/e)
Co-promotor: Dr. A.I. Cristea (University of Warwick, UK)
Public Defense: 02 July 2007

2007-12
Marcel van Gerven (RUN)
Bayesian Networks for Clinical Decision Support: A Rational Approach to Dynamic Decision-Making under Uncertainty
Promotor: Prof.dr.ir. Th.P. van der Weide (RUN)
Co-promotor: Dr. P.J.F. Lucas (RUN)
Public Defense: 05 September 2007

2007-13
Rutger Rienks (UT)
Meetings in Smart Environments – Implications of Progressing Technology
Promotor: Prof.dr.ir. A. Nijholt (UT)
Co-promotor: Dr. D. Heylen (UT)
Public Defense: 11 July 2007

2007-14
Niek Bergboer (UM)
Context-Based Image Analysis
Promotores: Prof.dr. H.J. van den Herik (UM), Prof.dr. E.O. Postma (UM)
Public Defense: 10 Oktober 2007

2007-15
Joyca Lacroix (UM)
NIM: a Situated Computational Memory Model
Promotores: Prof.dr. J.M.J. Murre (UM/UvA), Prof.dr. E.O. Postma (UM), Prof.dr. H.J. van den Herik (UM)
Public Defense: 20 September 2007

2007-16
Davide Grossi (UU)
Designing Invisible Handcuffs – Formal investigations in Institutions and Organizations for Multi-agent Systems
Promotor: Prof.dr. J.-J. Ch. Meyer (UU)
Co-promotor: Dr. F. Dignum (UU)
Public Defense: 17 September 2007

2007-17
Theodore Charitos (UU)
Reasoning with Dynamic Networks in Practice
Promotor: Prof.dr.ir. L.C. van der Gaag (UU)
Public Defense: 17 September 2007

2007-18
Bart Orriens (UvT)
On the development and management of adaptive business collaborations
Promotor: Prof.dr.ir. M.P. Papazoglou (UvT)
Co-promotor: Dr. J. Yang (UvT)
Public Defense: 12 September 2007

2007-19
David Levy (UM)
Intimate relationships with artificial partners
Promotores: Prof.dr. M.J.H. Meijer (UM), Prof.dr. H.J. van den Herik (UM)
Public Defense: 11 October 2007

2007-20
Slinger Jansen (UU)
Customer Configuration Updating in a Software Supply Network
Promotores: Prof.dr. S. Brinkkemper (UU), Prof.dr. P. Klint (CWI/UvA)
Public Defense: 08 October 2007

2007-21
Karianne Vermaas (UU)
Fast diffusion and broadening use: A research on residential adoption and usage of broadband internet in the Netherlands between 2001 and 2005
Promotor: Prof.dr. S. Brinkkemper (UU)
Co-promotor: Dr. L. van de Wijngaert (UU)
Public Defense: 26 November 2007

2007-22
Zlatko Zlatev (UT)
Goal-oriented design of value and process models from patterns
Promotor: Prof.dr. R.J. Wieringa (UT)
Public Defense: 04 October 2007

2007-23
Peter Barna (TU/e)
Specification of Application Logic in Web Information Systems
Promotores: Prof.dr. P. De Bra (TU/e), Prof.dr. G.-J. Houben (VUB/TU/e)
Public Defense: 30 October 2007

2007-24
Georgina Ramírez Camps (CWI/UvA)
Structural Features in XML Retrieval
Promotor: Prof.dr. M.L. Kersten (UvA/CWI)
Co-promotor: Dr.ir. A.P. de Vries (CWI/TUD)
Public Defense: 02 November 2007

2007-25
Joost Schalken (VUA)
Empirical Investigations in Software Process Improvement
Promotor: Prof.dr. J.C. van Vliet (VUA), Prof.dr. S. Brinkkemper (UU)
Public Defense: 17 December 2007

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2008
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2008-01
Katalin Boer-Sorbán (EUR)
Agent-Based Simulation of Financial Markets: A modular, continuous-time approach
Promotor: Prof.dr. A. de Bruin (EUR)
Co-promotor: Dr.ir. U. Kaymak (EUR)
Public Defense: 25 January 2008

2008-02
Alexei Sharpanskykh (VUA)
On Computer-Aided Methods for Modeling and Analysis of Organizations

Promotor: Prof.dr. J. Treur (VUA)
Public Defense: 10 January 2008

2008-03
Vera Hollink (UvA)
Optimizing hierarchical menus: a usage-based approach
Promotor: Prof.dr. B.J. Wielinga (UvA)
Co-promotor: Dr. M.W. van Someren (UvA)
Public Defense: 31 January 2008

2008-04
Ander de Keijzer (UT)
Management of Uncertain Data – Towards unattended integration
Promotor: Prof.dr. P.M.G. Apers (UT)
Co-promotor: Dr.ir. M. van Keulen (UT)
Public Defense: 01 februari 2008

2008-05
Bela Mutschler (UT)
Modeling and simulating causal dependencies on process-aware information systems from a cost perspective
Promotor: Prof.dr. R. J. Wieringa (UT)
Co-promotor: Dr. M.U. Reichert (UT)
Public Defense: 17 January 2008

2008-06
Arjen Hommersom (RUN)
On the Application of Formal Methods to Clinical Guidelines – An Artificial Intelligence Perspective
Promotor: Prof.dr.ir. Th.P. van der Weide (RUN)
Co-promotor: Dr. P.J.F. Lucas (RUN)
Public Defense: 18 April 2008

2008-07
Peter van Rosmalen (OU)
Supporting the tutor in the design and support of adaptive e-learning
Promotor: Prof.dr. E.J.R. Koper (OU)
Co-promotor: Prof.dr. P.B. Sloep (OU)
Public Defense: 18 April 2008

2008-08
Janneke Bolt (UU)
Bayesian Networks: Aspects of Approximate Inference
Promotor: Prof.dr.ir. L.C. van der Gaag (UU)
Public Defense: 21 April 2008

2008-09
Christof van Nimwegen (UU)
The paradox of the guided user: assistance can be counter-effective
Promotor: Prof.dr. L. van den Berg (UU)
Co-promotor: Dr. H. van Oostendorp (UU)
Public Defense: 31 March 2008

2008-10
Wauter Bosma (UT)
Discourse oriented summarization
Promotor: Prof.dr.ir. A. Nijholt (UT)
Co-promotor: Dr. M. Theune (UT)
Public Defense: 27 March 2008

(scheduled:)

2008-11
Vera Kartseva (VUA)
Designing Controls for Network Organizations: A Value-Based Approach
Promotores: Prof.dr. Y.-H. Tan (VUA), Prof.dr.ir R. Paans (VUA)
Co-promotor: Dr. J. Gordijn (VUA)
Public Defense: 28 May 2008

2008-12
Jozsef Farkas (RUN)
A Semiotically Oriented Cognitive Model of Knowledge Representation
Promotores: Prof.dr.ir. T.P. van der Weide (RUN)
Co-promotor: Dr. J.J. Sarbo (RUN)
Public Defense: 23 April 2008

2008-13
Caterina Carraciolo (UvA)
Topic Driven Access to Scientific Handbooks
Promotores: Prof.dr. M. de Rijke (UvA)
Co-promotor: Dr. J. Kircz (HvA)
Public Defense: 25 April 2008

2008-14
Arthur van Bunningen (UT)
Context-Aware Querying: Better Answers with Less Effort
Promotores: Prof.dr. P.M.G. Apers (UT), Prof.dr. L. Feng (Tsinghua University, China)
Co-promotor: Dr. M. Fokkinga (UT)
Public Defense: 13 Juni 2008

2008-15
Martijn van Otterlo (UT)
The Logic of Adaptive Behavior: Knowledge Representation and Algorithms for the Markov Decision Process Framework in First-Order Domains
Promotores: Prof.dr.ir A. Nijholt (UT), Prof.dr. J.-J.Ch. Meyer (UU)
Co-promotor: Dr. M. Poel (UT)
Referent: Dr. M. Wiering (RUG)
Public Defense: 30 May 2008

2008-16
Henriette van Vugt (VUA)
Embodied agents from a user's perspective
Promotores: Prof.dr. J. Kleinnijenhuis (VUA), Prof.dr. G.C. van der Veer (VUA)
Co-promotor: Dr. J. Hoorn (VUA), Dr. E.A. Konijn (VUA)
Public Defense: 25 June 2008

2008-17
Martin op 't Land (TUD)
Applying Architecture and Ontology to the Splitting and Allying of Enterprises
Promotor: Prof.dr.ir. J.L.G. Dietz (TUD)
Public Defense: 13 June 2008

(Note: date of completion of this list: 21 April 2008)