IfM Distributed Information and Automation Laboratory

UNIVERSITY OF CAMBRIDGE

DIAL Quarterly: Information Quality, project updates and conference news

Welcome from Professor Duncan McFarlane

It has been a busy three months for DIAL here in Cambridge, and we have concluded a large number of master's students projects as well as making significant progress on PhD student projects.
In addition to our regular articles, this issue is devoted to giving you a snap shot of the diverse range of student projects being tackled in DIAL. For those of you who have collaborated with us in them - thank you! For those of you interested in future involvement - please get in touch!

Information Quality for Asset Management

The ability to effectively manage assets can have a major impact on the profitability and operational performance of organisations. Managers rely on high quality information in order to make sound asset management (AM) decisions, such as whether to replace or maintain ageing pipes or the optimal level of critical spares to keep in stock. Information Quality (IQ) is a concept that is not widely understood by industry, and research on this topic is still relatively new.
DIAL has been conducting research on information quality in asset-intensive organisations for the last couple of years. Funded by the EPSRC, and supported by companies from different industry sectors, the work has already led to the development of processes and tools to assess, measure, and improve information quality.
These include:

- A hybrid approach to assess IQ that brings together the best set of activities from various assessment techniques to suit organisational requirements.
- Total Information Risk Management: A risk-based approach for quantifying the impact of IQ and evaluating IQ improvement options.

If you have difficulty opening any of the links, please click above for a web-based version

Recent Research Publications

Kelepouris, T., McFarlane D.C. & Giannikas, V.
A Supply Chain Tracking Model Using Auto-ID Observations, Under Review International Journal of Information Systems and Supply Chain Management (2011)

McFarlane, D. C., Cuthbert, R.
Modelling Information Requirements in Complex Engineering Services, Submitted to the Computers in Industry Special Issue on Product Service System Engineering: From Theory to Industrial Applications (2011)

Cuthbert, R., McFarlane, D. C.
Information Requirements for Complex Service Systems: A study of the London Borough of Sutton, Abstract submitted to Cambridge Service Week (2011)

Borek, A., Woodall, P., Parlikad, A. K. N.
A Risk Management Approach to Improving Information Quality for Operational and Strategic Management, EurOMA(Cambridge, 2011).
This paper is available here.

Borek, A., Helfert, M., Ge, M., Parlikad, A. K. N.

- A systematic methodology to implement an IQ improvement project.

We invite companies facing challenges related to data and information quality to work with us in refining these tools.
To find out more about our research in asset management and information quality, contact Ajith Parlikad.

Meet the team: Mark Harrison

Mark Harrison joined the Auto-ID Lab in Cambridge in May 2002 and took over as Director in April 2007. He has been active in a number of projects over the years, including the EU FP6 BRIDGE project as well as the Aerospace ID technologies programme, Airport Operations, the Drug Security Network and the SAHNE project with Boeing. He has also played a very active role in the development of open software standards for networked RFID at EPCglobal. He has been the lead editor of the Tag Data Translation standard and currently co-chairs the Discovery Services work group and a technical analysis sub-group of a joint requirements group for Network-centric / event-based electronic pedigree. Mark also contributed to the development of the EPC Information Services standard and has participated in the EPCglobal Architecture Review Committee and GS1 Architecture Group, as well as actively supporting the Air Transport Association in the development of a new Electronic Product Code format for unique identification of aircraft parts. He has also contributed the Tag Data Translation module to the Fosstrak open source project. Mark holds a PhD in physics from Cambridge.

Internet of Things in China

Alan Thorne has recently completed a mini-tour of the Far East, with visits to Shanghai and Hong Kong. First up for the Associate Director of the Auto-ID Lab, Cambridge was a trip to Shanghai. The city was playing host to the Internet of Things China 2011 Conference. The theme of IOT China 2011 was "Application and Industrialization on Internet of Things", which focused on successful applications of the technology. The city was also the setting for the bi-annual meeting of the world's Auto-ID Labs where he gave presentations about research activities in DIAL and the Cambridge Auto-ID Lab, with a particular focus on traceability and pedigree work. The event was well attended with over 500 people and good discussions were held about potential collaborative research with other organizations.

RFID and Air Cargo

Alan Thorne then attended the Hong Kong Air Cargo Exchange 2011. The event was organised by The Hong Kong Polytechnic University (PolyU) in collaboration with DHL Global Forwarding, Hong Kong Association of Freight Forwarding and Logistics (HAFFA), and Hong Kong R&D Centre for Logistics and Supply

An Information Oriented Framework for Relating IS/IT Resources and Business Value, International Conference on Enterprise Information Systems (Beijing 2011).

This paper is available here.

SOHOMA11 Conference

Professor Duncan McFarlane delivered a keynote speech in Paris last month at the SOHOMA11 Conference (1st International Workshop on Service Orientation in Holonic and Multi Agent Manufacturing Control). The Workshop is organized in the framework of the European FP7 Project ERRIC, the objective of which is to foster innovation in control of sustainable manufacturing and in this context to empower excellence in research in the faculty of Automatic Control and Computer Science of the University Politehnica of Bucharest thus enhancing its national and regional leadership position in selected areas of Intelligent Information Technologies applied to manufacturing.
Prof. McFarlane presented on "Distributed Information in Manufacturing and Industrial Services".
Download the presentation slides from here.

Ferrovial, Donarbon and Amey Visit

On Thursday 26th May 2011 Dame Prof. Ann Dowling, Prof. Duncan McFarlane, Prof. Robert Mair, Prof. Peter Guthrie, Dr Julian Allwood, Dr Ruchi Choudhary and Mr. Philip Guildford met with the Chief Executive Officers of Ferrovial, Amey and Donarbon.
Prof. McFarlane's involvement was to discuss DIAL activities in the Aerospace Sector.

Cambridge Auto-ID Workshop 18th May 2011

The IfM hosted a workshop on 18th May 2011 to bring together researchers from across the university who are working on Auto-ID technologies, including RFID, wireless sensor networks, etc. The workshop included researchers from the

Chain Management Enabling Technologies (LSCM). Alan presented findings from the Airport Operations Programme and discussed collaboration for future research initiatives.

Opportunities for Participation

Industrial Resilience

Change is inevitable. The future competitiveness of the firm is based on its capacity to respond and adapt to change. While some types of change can be readily anticipated and planned for, other less probable events can be significantly disruptive and carry a much greater burden of risk.
These disruptions and numerous others have dramatic repercussions on the operating conditions in which firms compete. Firms need to improve their resilience to such external events, having strategies practices and systems in place that allows the firm to either resist the change and withstand it or adapt to the new environment through innovative responses.
To explore these issues and identify how firms can improve their resilience, a new IfM project between DIAL and the Centre for Technology Management is starting in October 2011. To launch the new project, firms are invited to attend a 2.5 hour workshop at the Institute for Manufacturing at 13:30 on 16th September 2011. If you would like to join this workshop, receive more information about the project or indicate your interest in participating, please contact Simon Ford or Maurizio Tomasella.

Disruption Management Tool

Industrial assistance is required to test a disruption management auditing tool, designed to help organisations improve their ability to deal with unplanned disturbances in their service operations. The tool originates and has been tested in 'production' system environments. It is in the process of being adapted to 'service' operation environments, and requires industrial support to commence trials. The benefits of participation include a qualitative evaluation of the firm's ability to handle disturbances that affect service goals and performance. For more details, contact Dharm Kapletia or Duncan McFarlane.

Would you like to know how information quality impacts your business?

We are looking for an UK based engineering company (e.g. in tranport, utility, energy, manufacturing, aerospace etc.) that would be interested in understanding the risks that arise from poor data and information quality for the company's operations and/or strategy and in finding out potential solutions relevant for the company. A practice-oriented process for Total Information Risk Management is used for this study that has been developed by our PhD student, Alexander Borek, which he successfully applied in several medium-sized and large organisations across Europe. If you are generally interested and would like to hear more about this study, please contact Alexander Borek. To see the poster for this project please click here.

Department of Engineering, the Judge Business School and the Computer Laboratory.
Presentations included applications of the technology in tracking of people and the spread of epidemics, wildlife monitoring, monitoring of civil engineering, as well as discussions on shared infrastructure and security. A mailing list has been set up to promote further discussion and collaboration across the university.
For further information, please contact Mark Harrison.

SAP Business Intelligence and Business Object training at IfM 20th-24th June 2011

The SAP University Alliances held a 5-day workshop for 16 delegates from different universities at the Institute for Manufacturing. The course was delivered by 5 consultants from the Irish Service Centre and from the UK's Business Objects operation. The delegates were exposed to a set of Business Intelligence tools from basic data warehousing to advanced reporting such as SAP Business Explorer (BEx), BusinessObjects BI for SAP and SAP Crystal Solutions Support.

Centre for Smart Infrastructure – An Innovation and Knowledge Centre

On 12th May The Centre for Smart Infrastructure and Construction (CSIC) held its first symposium to mark its 1st April 2011 opening. This was held at the Institute for Manufacturing followed by a reception at Jesus College and a dinner at St. John's College.
For more details please click on this link.

Future Events

Upcoming DIAL Seminars:

Value of sensing

28th July 2011 14.00-15.00
Ahmed Kadri, visiting student, DIAL, University of Cambridge.

Value of information for

Value Based Pricing of Information

We have developed a framework to assist organizations with pricing of information-based products or services using a value based approach. We are currently seeking industrial participants that might have an interest in exploring the application of the framework. We are hoping to receive feedback to help us validate the framework and to update it as required. You can contact Pankaj Sood for more information.

Case studies in Maintenance of Complex Engineering Assets

Nipat Rasmekomen, a doctoral student at DIAL is looking to carry out a number of case studies on the maintenance of complex engineering assets, such as automated integrated production lines, trains, marine propulsion systems etc. Benefits of taking part would include a report on how failure or degradation of some parts of the asset can cuase problems that need additional maintenance process maps and recommendation for improvements. If you would like to participate or would like more information, please contact Nipat Rasmekomen.

Information System Performance for Complex Engineering Services

Opportunities for participating in the area of information system (IS) performance for Complex Engineering Services will enable organisations to benefit from:

- a full appraisal of information requirements (IR) for service delivery
- an assessment of the IS capability against the IRs
- the provision of a "contract information capability metric".

Organisations moving towards service provision take on new roles and responsibilities requiring new information to support the contracts. Information capability is based around systems not designed for service-based businesses. This work will enable the assessment of IS capability against the service delivery IRs. More information is available from Rachel Cuthbert.

DIAL-up: Student profiles

Service Information: Rachel Cuthbert is conducting research towards a PhD on the impact of service information requirements (IRs) on information system capability. The work looks at the delivery of availability contracts within the context of Complex Engineering Services, focussing on understanding the critical decisions, and the information required to support these decisions, throughout the service delivery process. The research provides a means of assessing, pre contract, the capability of the information needs to a given contract and the suitability of the contract type given a set of IRs.

Pricing of Information: Pankaj Sood is reading for a PhD with DIAL. His research interest is in exploring pricing of information for low probability high impact events. His work focuses on understanding how events are classified, risks quantified and value of information determined based on the reduction in

maintenance decisions

18th August 2011 14.00-15.00
Raj Srinivasan, DIAL, IfM, University of Cambridge.
Seminar 2, Institute for Manufacturing, 17 Charles Babbage Road, Cambridge

Title to be confirmed

Thursday 1st September 2011
14:00-15:00 Jim (Chee Siang) Ang and Farzin Deravi, University of Kent.
Seminar 2, Institute for Manufacturing, 17 Charles Babbage Road, Cambridge
For a regularly updated list of DIAL Seminars please click here.

Zied invited to speak at IBM Visualization Global Workshop

Dr Zied M. Ouertani has been invited to speak at the IBM Visualization Global Workshop on 21st of July. Zied will share the latest research on performance information reporting and visualization research conducted within the DIAL group. This 2-day workshop brings together creative, business strategy and technical leads, IBM subject matter experts drawn from appropriate consulting and research disciplines.

Service Innovation: Competitive advantage through new business models

21st September 2011
This one-day conference explores how leading organisations develop innovative business propositions to drive their competitive advantage through service innovation. Keynote speakers share the latest thinking on business model innovation from the Cambridge Service Alliance. Further details.

Asset Management Conference

30th November – 1st December 2011 The Institution of Engineering and Technology (IET), Savoy Place, London
For the first time since its inception the Asset Management Conference 2011 will provide you

risk that can be achieved through the use of information. He is also developing a value based pricing framework and is exploring various strategies that could assist information producers and information consumers to minimise risks posed by information production or procurement.

Information and Risk: Alexander Borek's research focuses on developing a process for Total Information Risk Management (TIRM), which helps to identify, assess and treat operational and strategic risks that arise from poor information quality. He works closely with his partners from different industries like manufacturing, transport, utility and energy to test and refine the TIRM process through application in these organisations. His further research interests are centered around how IT creates business value through information quality and how data quality tools and techniques can be used to assist information quality improvement in companies.

UPDATE: Masters Student projects with DIAL

In the last issue we highlighted a number of DIAL projects being conducted by some of the IfM's undergraduate and MPhil students. Here is an update on their progress.

Airport Reconfigurability: Sahil Shah is a 4th year Manufacturing Engineering student. Following on from previous research by DIAL with the Manchester Airport Group, this 6 week project investigated the reconfigurability of check-in services at Manchester Airport, terminals 1 and 3. Through observation of the process and workshops with representatives from Manchester Airport Group, the research identified scenarios that could affect the check-in process at Manchester Airport within the next 10 years. A methodology was developed to identify feasible alternative configurations that Manchester Airport could use to cope with the changing demands brought by the future scenarios. Although focusing on check-in services in particular, this research could be the starting point for further reconfigurability analysis of other related processes within Manchester Airport.

Data Quality Assessment Methods (Ulrich Saiger): The purpose of this research was to explore the broad area of data quality assessment. More precisely, the activities which are used in existing data quality (DQ) assessment techniques (ATs). Previous

with the platform to have your say, to promote your work, theories and case studies. We are pleased to announce the call for papers for the Asset Management conference 2011.
The main event programme will feature keynote presentations to support and introduce accepted submitted paper presentations from a wide range of industry sectors and academia. All papers will be peer reviewed and accepted papers will be delivered by oral presentations or posters. Further details

For more information on any of the presentations/papers mentioned please contact us.

research by DIAL has highlighted that all ATs can be broken down into common activities and has developed a methodology that allows these activities to be combined into a new AT. However, it does not provide any guidance of which activities have to be included in an AT and what is the best way of ordering them. Consequently, the aim of this research was to answer the following research question: Which activities from existing data DQ ATs must be included in every AT and what is the best way of ordering the activities to produce a new DQ AT? Based on the findings of the case studies, the optimal position could be identified and therefore recommendations about the order could be made. The results provided a guideline for ordering activities by composing a new AT based on the individual DQ requirements of an organisation.

Automation and Industrial Energy (Ikechukwu Ofodu): The primary aim of the research was to develop an automation-based energy assessment tool that can be used by automation solution providers and manufacturers to assess energy reduction in manufacturing operations. This project was supported by OMRON UK. Through case studies in five manufacturing firms, a tool was developed which includes the introduction of a new paradigm of energy efficiency with automated maintenance scheduling, enabling the discovery of a research opportunity in the foundry and casting industry. The tool developed is an automation-based energy audit procedure that automation vendors or manufacturers can use for efficiently identifying opportunities to use automation to reduce energy consumption in manufacturing operations.

Data Visualisation for Management Decisions (Burcu Bora): The research explored how visualization software can support decision-makers in deriving insights from the ever-increasing amount of information. Ten different case studies were conducted and a cross-case analysis took place to understand the role of information visualisation software in supporting management decisions. Three main roles of visualization software in supporting management decision have been identified, namely as: (i) communication, (ii) analysis, and (iii) monitoring. Current software capabilities were also studied to understand how do they enable the identified roles of visualization software. This analysis allowed for the categorization of the software capabilities into three main groups, namely as: (i) visual representation techniques, (ii) interactivity capabilities, and (iii) collaboration facilities. Finally, benefits and risks related to using visualisation software were discussed exposing the strengths and weaknesses of using visualisation software in supporting the decision-making process. Future prospect identified following from this research study is to understand how such

information visualization software enable collaborative data analytics to support management decisions.

RFID Tags in Concrete (Honda Petchaporn):
Research work has developed methods and test procedures for measuring the performance of RFID tags when embedded in concreted components. Honda has specifically focused on measuring the changing performance of the passive UHF RFID tag during the concrete curing process. This is a critical consideration when indentifying a cost effective tag for specific operational requirements during the manufacturing processes. The current work examines a number of product variations including re-bar configuration, tag depth and oven curing processes. Follow on work will continue to examine some of the re-bar / tag configurations, performance of battery assist tags and operational considerations required for industrial deployment. DIAL would like to thank Laing O'Rouke, Omni-ID and RedBite Solutions for their support and help on this project.

Value of Sensing in Infrastructure (Nicolas Rubir): The topic is a growing area of interest for the construction industry, allowing new inspection methods and maintenance strategies to be used that are not reliant on costly traditional visual inspection techniques. Nicolas's work has reviewed the current use of sensors for health monitoring and developed a mathematical model in order to optimise infrastructure maintenance strategies. The model can be used to quantify the value of sensing in infrastructure and see if it is worth deploying a monitoring system. In order to test the model a case study was carried out with London Underground on the Jubilee line.

If you are interested in anything that has been featured in the newsletter or would like further information about DIAL, then please do not hesitate to contact us on dial-enquiries@eng.cam.ac.uk or call Sarah Hofsten on +44 (0)1223 764306.

To subscribe you or a colleague to the DIAL quarterly newsletter, please visit www.ifm.eng.cam.ac.uk/newzapp.html

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