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AComIn:
Advanced Computing for Innovation

FP7 Capacity Programme
Research Potential of Convergence Regions

D7.4
Input for EC Review in Month 18

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Version 1.0

EXECUTIVE SUMMARY

This Deliverable Report contains information about the performed activities and results, achieved in the first reporting period of the project AComIn (project months 1-18, 1 October 2012 – 31 March 2014). It summarises the information presented in the following Deliverables:

- D1.1 Strengthening the IICT Human potential - Month 18
- D2.2 Infrastructure Upgrade and Integration - Month 18
- D2.3 Building User Communities - Month 18
- D3.1 Networking - Month 18
- D4.2 Innovation Capacity Building activities - Month 18
- D5.1 Dissemination activities - Month 18

Deliverable 7.4 presents briefly the project achievements during the reporting period for all Work Packages. It also contains the full list of AComIn-related publications: 100 published papers and 23 under print.

The AComIn performance is assessed in terms of the measurable performance indicators, defined in the project Technical Annex, where the baseline results of the Institute for Information and Communication Technologies (IICT-BAS) in 2001 are presented. In 2013, there was a clearly seen, significant increase in the numbers of high quality papers published by IICT researchers. The number of defended PhD theses also grew as well as the number of projects with Bulgarian SMEs.

Deviations from the project schedule and contingency actions are outlined. Having in mind that the delays can be overcome, we conclude, that in project period 1 AComIn has achieved most of its objectives and technical goals with relatively minor deviations.

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Summary	Deliverable D7.4 generalises information about the performed activities and results, achieved under the first reporting period of the project AComIn (months 1-18, 1 October 2012 – 31 March 2014). The deliverable text is intended to serve as a concise input for the intermediate EC review in month 18.
Keywords	Project achievements, Assessment in terms of performance indicators, Deviations from schedule, Contingency plan

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1 INTRODUCTION

Deliverable D7.4 aims at generalising the information about the performed activities and results, achieved in the first reporting period of the project AComIn (project months 1-18, 1 October 2012 – 31 March 2014). Thus D7.4 provides a summary of the detailed presentations of the work carried out in the AComIn Work packages, contained in the set of project deliverables, submitted at Month 18:

- D1.1 Strengthening the IICT Human potential - month 18,
- D2.2 Infrastructure Upgrade and Integration,
- D2.3 Building User Communities - month 18,
- D3.1 Networking - month 18,
- D4.2 Innovation Capacity Building activities - month 18,
- D5.1 Dissemination activities - month 18.

The deliverable text is intended to serve as a concise input for the intermediate EC review in month 18.

2 ACHIEVEMENTS IN ACOMIN PERIOD 1

In this section we present the work done and the achievements within each project Work Package.

2.1 WP1: Strengthening the IICT Human potential

Recruitment of incoming experienced scientists is one of the major project objectives; it is an instrument for strengthening the IICT research capacity. In project month 1, the Executive Board of AComIn approved a procedure for searching and recruiting incoming candidates for the AComIn post-doctoral positions. The search for appropriate candidates is made by means of Job announcements at various EU job/mobility-portals as well as by an active campaign to contact personally colleagues from good research groups and established teams in the South-East European region. After eligibility check of the submitted application documents, a potential host professor is assigned to each candidate. He/she fills in a Candidate Evaluation Form, evaluating the candidate's research capacity in the context of the AComIn project. The Executive Board votes and either approves or rejects the candidate. The proposal for employment, submitted to the IICT Director, is accompanied by a Personal Research Plan. The Executive Board also approved the Career Development principles, applied in the organisation and management of AComIn activities in order to support the personal development of the young experienced researchers. Deliverable D1.1 presents in detail the searching activities as well as the recruiting and monitoring procedures.

During the first reporting period six incoming experienced researchers with less than 10 years of scientific experience (post-docs) have been recruited. The selected post-docs fulfilled the requirement to have solid /mathematical/ background, profound knowledge of the basic technologies, publications in international peer-reviewed journals or conference proceedings, and PhD degree in one of the AComIn areas of interest:

- Advanced Computing,
- Language and Semantic Technologies,
- Signal and Image Processing as well as
- Optimisation and Intelligent Control.

The durations of their employments are summarised in Table 1. Detailed accounts of the personal research achievements of the six incoming experienced post-docs are presented in D1.1, sections 2.4.1 - 2.4.6. The research plans of the post-docs are included as well; they are approved on yearly basis. In this way Dr. Stanislav Stoykov and Dr. Jean Michel Sellier have each two research plans for 2012-2013 and 2013-2014 that are included in the respective sections of D1.1.

Name of the Post Doc	Starting date of employment	End date of employment or end date of Reporting period
Dr. Stanislav Stoykov	16 October 2012	continues working at 31/03/2014
Dr. Irina Temnikova	17 October 2012	31 May 2013
Dr. Jean Michel Sellier	19 November 2012	continues working at 31/03/2014
Dr. Clemens Hofreither	1 August 2013	continues working at 31/03/2014
Dr. Ivan Georgiev	2 September 2013	continues working at 31/03/2014
Dr. Vladimir Kotev	3 December 2013	continues working at 31/03/2014

Table 1. Employed incoming post-docs with long-term contracts by 31 March 2014

In the AComIn Technical Annex, short-term scientific missions are planned for incoming scientists with more than 10 years of scientific experience, to perform:

- lecturing at high-quality intensive seminars including events held with User Communities,
- innovation-related tasks,
- technology transfer activities,
- joint research activities including writing high-quality papers and monographs etc.

During the first reporting period six incoming scientists with more than 10 years of scientific experience were employed. The durations of their employments are summarised in Table 2. Detailed accounts of the personal contributions of the six incoming experienced scientists are presented in D1.1, sections 3.1 - 3.6.

Experienced researcher	Affiliation	Starting date of employment	End date of employment
Prof. Raytcho Lazarov	Department of Mathematics, Texas A&M University, College Station, TX, USA	10/04/2013	10/05/2013
Prof. Darina Dicheva	Department of Computer Science, Winston-Salem State University, NC, USA	03/06/2013	02/07/2013
Prof. Hristo Dichev	Department of Computer Science, Winston-Salem State University, NC, USA	03/06/2013	03/07/2013
Prof. Milena Dobreva	Faculty of Media and Knowledge Sciences, University of Malta, Malta	18/06/2013	17/07/2013
Dr. Petar Goulev	Digital Fashion Studio, London College of Fashion, University of the Arts, London, UK	15/08/2013	15/09/2013
Prof. Johannes Kraus	Johann Radon Institute for Computational and Applied Mathematics (RICAM), Austrian Academy of Sciences, Linz, Austria	01/10/2013	31/10/2013

Table 2. Employed incoming scientists with short-term contracts by 31 March 2014

The recruited researchers both with long-term or short-term contracts have contributed essentially to strengthen the IICT human research potential in project period 1. They have brought to IICT new topics of research, new skills, new connections and new horizons in many diverse and challenging research areas in the AComIn context:

- beam models and their application to computer simulation of dynamical behaviour of engineering structures with complex geometry;
- corpus linguistics and automatic processing of sublanguages; terminology extraction from Wikipedia and patent texts;
- semi-classical and quantum transport simulations; development of efficient algorithms and performing very complex numerical simulators that enable to study some possibilities of having quantum computing;
- finite elements based on piece-wise harmonic test functions; isogeometric analysis and its applications in beam models;
- robust preconditioning methods for non-standard FEM discretisations like the Discontinuous Galerkin Methods; interdisciplinary research activities and industrial applications with Computed Tomography and 3D Scanning;
- mechatronics and bio-robotics; transfer of prototypical mechatronic devices to industrial applications;
- computational mathematics and recent developments in Finite Element Methods;
- design and development of large interoperable repositories of digital educational objects and their application in real-life educational systems;
- multimodal capture, semantic analysis and 3D representation of Cultural Heritage;
- user modeling and user satisfaction in the exploitation of digitalised educational and cultural content;
- application of advanced 3D technologies in the textile industry and fashion;
- development, study, analysis and implementation of preconditioners for systems arising in finite elements approximation of second order elliptic problems, describing processes in highly heterogeneous media.

A Technology Transfer Seminar with the 3D User Community was organised by Dr Goulev, an incoming experienced researcher. Intensive cycles of lectures were given. Further details about all IICT achievements, enabled by the recruitments of experienced researchers, are presented in D1.1.

2.2 Scientific Papers published during the first project period

The joint work of the employed incoming scientists with IICT staff stimulated a wide range of research studies and experiments (including also use of Smart Lab devices), supported by the AComIn project. They resulted in the authoring of 123 scientific publications (100 published and 23 under print) that acknowledge the AComIn support.

Publication Lists are presented also in the Deliverables D1.1, D3.1 and D5.1, all submitted at month 18, as follows:

- **30** publications in D1.1 that are authored or co-authored by the incoming experienced researchers (20 of them are published and 10 are accepted for publication);

- **56** publications in D3.1 that are authored or co-authored by IICT experienced researchers (54 published in the Proceedings of the respective scientific conferences or workshops, 2 accepted for publication);
- **28** publications in D5.1 that are authored or co-authored by IICT experienced researchers, published in the Proceedings of events organised by IICT with partial AComIn support:
  - **7** accepted papers in the Springer Proceedings of the 9th International Conference "*Large-Scale Scientific Computations*" (LSSC'13), 3-7 June 2013, Sozopol, Bulgaria;
  - **5** published papers in the Proceedings of the 9th International Conference "*Recent Advances in Natural Language Processing*" (RANLP-2013), 7-13 September 2013, Hissar, Bulgaria; the papers are uploaded at the Anthology of the Association for Computational Linguistics;
  - **5** published papers after talks presented at the Workshop "*Information and Communication Technologies for Human Health and Quality of Life* (ICT – HuHeQuL'13), 15-16 May 2013, Stara Zagora Mineral Baths, Bulgaria;
  - **2** published papers after talks presented at the International Workshop "*Autonomic Computing and Automatic Control in Computer Systems*" (ACACCS), a co-event of the International Conference "*Automatics and Informatics 2013*", 3-4 October 2013, Sofia, Bulgaria;
  - **9** published papers in the Proceedings of the Workshop "*ICT for New Materials and Nanotechnologies*" (NewNano'13), a co-event of the International Conference "*Robotics, Automation and Mechatronics 2013*", 8-9 October 2013, Bankya, Bulgaria.

In this way the Lists in the Deliverables D1.1, D3.1 and D5.1 reflect only the activities relevant to the respective Work package (and partly overlap).

Here we present a full, unified List of all AComIn Papers published in period 1 or accepted for publication. They present the scientific content of the project results. For convenience, the List is divided into "Papers with DOI" and "Papers without DOI". The Papers with DOI are also imported in the AComIn Reporting pages at the EC Participant Portal.

Peer Reviewed Papers with DOI – AComIn project, period 1 (months 1-18)

Publications with DOI in Peer Reviewed Journals

1. Nedjalkov, M., P. Schwaha, S. Selberherr , J. M. Sellier, D. Vasileska. Wigner quasi-particle attributes—An asymptotic perspective. Applied Physics Letters 102, art. no. 163113, 163113-1 - 163113-4. ISSN: 0003-6951. IF (2012): 3.794. 5-year IF: 3.817. DOI 10.1063/1.4802931

2. Sellier, J. M., M. Nedjalkov, I. Dimov, S. Selberherr. Decoherence and Time Reversibility: the Role of Randomness at Interfaces. Journal of Applied Physics, AIP Publishing, 2013. p. 174902 (7 pages). DOI 10.1063/1.4828736

3. Karaivanova A., E. Atanassov, T. Gurov (2013), Monte Carlo Simulation of Ultrafast Carrier Trasport: Scalability Study, In: Alexandrov V., M. Lees, V. Krzhizhanovskaya, Jack Dongarra and Peter M.A. Sloot (Eds.),Proceedings of ICCS 2013, 5-7 June 2013, Barcelona, ELSEVIER Procedia Computer Science 18 (2013), pp. 2298-2306, ISSN: 1877-0509. DOI: 10.1016/j.procs.2013.05.401

4. Stoykov, S. and S. Margenov. Nonlinear Vibrations of 3D Laminated Composite Beams. Mathematical Problems in Engineering, Vol. 2014, pp. 1-14, DOI 10.1155/2014/892782

5. Kraus, J., M. Lymbery, and S. Margenov. Robust algebraic multilevel preconditioners for anisotropic elliptic problems. Springer Proceedings in Mathematics and Statistics. Vol. 45, ISSN 2194-1009, pp. 217-246. DOI 10.1002/nla.1876

6. J.M. Sellier, I. Dimov. A Wigner approach to the study of wave packets in ordered and disordered arrays of dopants. Physica A: Statistical Mechanics and its Applications, doi: http://dx.doi.org/10.1016/j.physa.2014.03.065, 2014

7. J.M. Sellier, I. Dimov. A Wigner Monte Carlo Approach to Density Functional Theory. Journal of Computational Physics, Elsevier, 2014. ISSN: 0021-9991.
http://dx.doi.org/10.1016/j.jcp.2014.03.065

8. J.M. Sellier, S. Amoroso, M. Nedjalkov, S. Selberherr, A. Asenov, I. Dimov. Electron Dynamics in Nanoscale Transistors by Means of Wigner and Boltzmann Approaches. Physica A, Elsevier, 2013. DOI 10.1016/j.physa.2004.04.121

9. Stoykov, S., S. Margenov. Numerical computation of periodic responses of nonlinear large-scale systems by shooting method, Computers & Mathematics with Applications, DOI 10.1016/j.camwa.2014.01.023

10. Georgieva, I. and C. Hofreither. Interpolation of harmonic functions based on Radon projections. Numerische Mathematik, November 2013. DOI 10.1007/s00211-013-0592-y

11. Georgieva, I. and C. Hofreither. Cubature Rules for Harmonic Functions Based on Radon Projections. Calcolo, March 2014. Springer Milan, DOI 10.1007/s10092-014-0111-2

12. Radeva, I., Multi-Criteria Models for Cluster Design. Cybernetics and Information Technologies, Vol . 13, No. 1, Sofia 2013, Print ISSN-9702, Online ISSN 1314-4081, pp. 18-33. DOI: 10.2478/cait-2013-0003

13. Hristov V, G. Agre. A Software System for Classification of Archaeological Artefacts Represented by 2D Plans. Cybernetics and Information Technologies, Vol. 13, № 2, ISSN 1311-9702, pp. 82-96. DOI: 10.2478/cait-2013-0017

14. Dichev, C., D. Dicheva, G. Agre, and G. Angelova. Current Practices, Trends and Challenges in K-12 Online Learning. Cybernetics and Information Technology, Vol. 13 No. 3, ISSN 1311-9702, pp. 91-110, DOI 10.2478/cait-2013-0028

15. Fidanova S. Application of HPD Model for Predicting Protein Mutations. Cybernetics and Information Technologies, Vol 13., No. 4, pp. 95-103. DOI: 10.2478/cait-2013-0056

16. Stoilova, K., T. Stoilov, K. Nikolov. Autonomic Properties in Traffic Control. Cybernetics and Information Technology, Vol. 13, No 4, pp. 18-32. DOI: 10.2478/cait-2013-0050

17. Trichkova, E., K. Stoilova. An Approach for Quality Assessment and ffectiveness of a Web-Based System for Distance Learning. Cybernetics and Information Technology, Vol. 13, No 4, pp. 63-73. DOI: 10.2478/cait-2013-0054

18. Vassil Sgurev, Stanislav Drangajov. Risk Estimation and Stochastic Control of Innovation Processes. Cybernetics and Information Technology, Volume 14, No 1, pp.3-10, DOI: 10.2478/cait-2014-0001

19. Doukovska L., S. Vassileva. Intelligent Methods for Process Control and Diagnostics of Mill Fan System. Cybernetics and Information Technologies, Vol. 14, No. 1, pp. 151-160, DOI: 10.2478/cait-2014-0012

20. Dzhambov, V. High Precision Computing of Definite Integrals with .NET Framework C# and X-MPIR. Cybernetics and Information Technologies, Vol. 14, No. 1, pp. 172-182, DOI: 10.2478/cait-2014-0014

21. Stoilova, K., T. Stoilov, H.Abouaïssa. Traffic Lights Optimization with Measurements of Noise Levels. Proceedings of the 1st IFAC Workshop on Advances in Control and Automation Theory for Transportation Applications, September 16-17, 2013. Istanbul, Turkey, Control and Automation Theory for Transportation Applications, Volume # 1, Part# 1, pp. 31-36, DOI 10.3182/20130916-2-TR-4042.00019

Articles/Sections with DOI in an Edited book or Book series - AComIn months 1-18

22. Georgieva, I., C. Hofreither and R. Uluchev. Least Squares Fitting of Harmonic Functions Based on Radon Projections. In: Morten Daehlen, Michael Floater, Tom Lyche, Marie-Laurence Mazure, Knut Morken, and Larry L. Schumaker (Eds.) Mathematical Methods for Curves and Surfaces, Lecture Notes in Computer Science Volume 8177, 2014, pp. 158-171, DOI 10.1007/978-3-642-54382-1_9 (SJR: 0.332)

23. Cantoni, V., D.T. Dimov, Structural Blocks Retrieval in Macromolecules: Saliency and Precision Aspects. In: ICIAP Workshops, Lecture Notes in Computer Science, Vol. 8158, Springer, pp. 372-380, ISSN 0302-9743, ISBN 978-3-642-41189-2, DOI 10.1007/978-3-642-41190-8_40

24. Koprinkova-Hristova, P., K. Alexiev. Echo State Networks in Dynamic Data Clustering In: Mladenov, V., Koprinkova-Hristova, P., Palm, G, Villa, A.E.P., Appollini, B., Kasabov, N. (Eds.) ICANN 2013, Lecture Notes in Computer Science, vol. 8131, ISSN: 0302-9743, ISBN: 978-3-642-40727-7, DOI: 10.1007/978-3-642-40728-4_43, Springer-Verlag Berlin Heidelberg, pp. 343-350.

25. Todorov, Y., M. Terzyiska, and M. Petrov. Recurrent Fuzzy-Neural Network with Fast Learning Algorithm for Predictive Control. In: Mladenov, V., Koprinkova-Hristova, P., Palm, G, Villa, A.E.P., Appollini, B., Kasabov, N. (Eds.) ICANN 2013, Lecture Notes in Computer Science, vol. 8131, ISSN: 0302-9743, ISBN: 978-3-642-40727-7, DOI 10.1007/978-3-642-40728-4_58, Springer-Verlag Berlin Heidelberg, pp. 459-466.

Publications with DOI in Peer Reviewed Proceedings of a Conference/Workshop - AComIn months 1-18

26. Amoroso, S., L. Gerrer, A. Asenov, J. M. Sellier, I. Dimov, M. Nedjalkov, and S. Selberherr. Quantum Insights in Gate Oxide Charge-Trapping Dynamics in Nanoscale MOSFETs. Proceedings of the 18th International Conference on Simulation of Semiconductor Processes and Devices, IEEE, 2013, pp.25 – 28. DOI 10.1109/SISPAD.2013.6650565

27. Sellier, J.M., M. Nedjalkov, I. Dimov, and S. Selberherr. Two-dimensional Transient Wigner Particle Model. Proceedings of the 18th International Conference on Simulation of Semiconductor Processes and Devices, IEEE, 2013, pp. 404 –407. DOI 10.1109/SISPAD.2013.6650660

28. Angelova, G. Automatic information extraction from patient records in Bulgarian language. Proceedings of the 14th Int. Conf. CompSysTech '13, ACM Press, pp. 11-14, DOI 10.1145/2516775.2516777

29. Dimitrov, S. and T. Stoilov. Loading test of Apache HTTP server by video file and usage measurements of the hardware components. Proceedings of the 14th Int. Conf. CompSysTech '13, ACM Press, pp. 59-66, DOI 10.1145/2516775.2516799

30. Nedkov, S. and D. Dimov. Emotion recognition by face dynamics. Proceedings of the 14th Int. Conf. CompSysTech '13, ACM Press, pp. 128-136, DOI 10.1145/2516775.2516794

31. Ivanov, V. A program for an automatic PicoBlaze type embedded system generation. Proceedings of the 14th Int. Conf. CompSysTech '13, ACM Press, pp. 91-97, DOI 10.1145/2516775.2516784

32. Tashev, T. and V. Monov. A computer modeling of the throughput of a crossbar switch by PI-patterns for uniform traffic with variable intensity. Proceedings of the 14th Int. Conf. CompSysTech '13, ACM Press, pp. 53-58, DOI 10.1145/2516775.2516790

33. Alexiev K., Iv. Nikolova, An Algorithm for Error Reducing in IMU. In: Proc. of 2013 IEEE International Symposium on Innovations in Intelligent Systems and Applications (INISTA), 19-21 June 2013, Albena, Bulgaria, IEEE Xplore©, ISBN: 978-1-4799-0659-8, pp.1-6, DOI 10.1109/INISTA.2013.6577663

34. Borissova D., I. Mustakerov, A concept of intelligent e-maintenance decision making system. In: Proc. of 2013 IEEE International Symposium on Innovations in Intelligent Systems and Applications (INISTA), 19-21 June 2013, Albena, Bulgaria, IEEE Xplore©, ISBN: 978-1-4799-0659-8, DOI 10.1109/INISTA.2013.6577668

35. Koprinkova-Hristova, P., D. Angelova, D. Borisova, and G. Jelev. Clustering of Spectral Images Using Echo State Networks. In: 2013 IEEE International Symposium on Innovations in Intelligent Systems and Applications, IEEE INISTA 2013, June 19-21, Albena, Bulgaria, IEEE Xplore©, ISBN: 978-147990661-1, DOI 10.1109/INISTA.2013.6577633

36. Koprinkova-Hristova, P., L. Doukovska, and P. Kostov. Working regimes classification for predictive maintenance of mill fan systems. In: Proc. of 2013 IEEE International Symposium on Innovations in Intelligent Systems and Applications, IEEE INISTA 2013, June 19-21, Albena, Bulgaria, IEEE Xplore©, ISBN: 978-147990661-1, DOI 10.1109/INISTA.2013.6577632

37. Dezert J., A. Tchamova, D. Han and J.-M. Tacnet. Why Dempster's rule doesn't behave as Bayes rule with informative priors". In: Proc. of IEEE International Symposium on Innovations in Intelligent Systems and Applications (INISTA), Albena, Bulgaria, 19-21 June, 2013, IEEE Xplore©, ISBN:978-1-4799-0659-8, DOI 10.1109/INISTA.2013.6577631

38. Tchamova A. and J. Dezert. Tracking applications with fuzzy-based fusion rules. In: Proc. of IEEE International Symposium on Innovations in Intelligent Systems and Applications (INISTA), Albena, Bulgaria, 19-21 June 2013, IEEE Xplore©, ISBN:978-1-4799-0659-8, DOI 10.1109/INISTA.2013.6577630

39. Mustakerov I., D. Borissova. An intelligent approach for optimum maintenance strategy defining. In: Proc. of 2013 IEEE International Symposium on Innovations in Intelligent Systems and Applications (INISTA), 19-21 June 2013, IEEE Xplore©, Print ISBN: 978-1-4799-0659-8, DOI 10.1109/INISTA.2013.6577666

40. Strandjev, B. and G. Agre. On applicability of Principal Component Analysis to concept learning from images. In: Proc. of IEEE International Symposium on Innovations in Intelligent Systems and Applications (INISTA), 9-21 June 2013, Albena, Bulgaria, IEEE Xplore©, 1-5, ISBN 978-1-4799-0659-8, DOI 10.1109/INISTA.2013.6577623

41. Todorov Y., M. Terziyska, S. Ahmed, M. Petrov. Fuzzy-Neural Predictive Control using Levenberg-Marquardt optimization approach. In: Proc. of International IEEE conference on

Innovations in Intelligent Systems and Applications, INISTA'2013, Albena, Bulgaria, ISBN 978-1-4799-0659-8, pp. 1-5. DOI 10.1109/INISTA.2013.6577624

42. Garvanov, I. EXC CFAR BI Processor with Polar Hough Transform in the Presence of Binominal Impulse Interference, In: Proc of the Signal Processing Symposium SPS-2013, 5-7 June 2013, Jachranka, Poland, ISBN: 978-1-4673-6319-8-13- 2013 IEEE, 4 pages, DOI 10.1109/SPS.2013.6623594

43. Sgurev V., L. Doukovska, S. Drangajov, and V. Nikov, Network Flow Interpretation of Innovation Processes and Risks. In: Proc. of the Signal Processing Symposium – SPS'13, Jachranka Village, Poland, CD, ISBN 978-1-4673-6319-8-13- 2013 IEEE. DOI 10.1109/SPS.2013.6623603

44. Shahpazov V., V. Velev, L. Doukovska (2013), Design and Application of Artificial Neural Networks for Predicting the Values of Indexes on the Bulgarian Stock Market. In: Proc. of the Signal Processing Symposium – SPS'13, Jachranka Village, Poland, CD, ISBN 978-1-4673-6319-8-13- 2013 IEEE. DOI 10.1109/SPS.2013.6623604

45. Boshnakov K., L. Doukovska, E. Mihailov, V. Petkov, S. Vassileva, S. Kojnov. Predictive Maintenance Model-Based Approach for Objects Exposed to Extremely High Temperatures. In: Proc. of the Signal Processing Symposium – SPS'13, Jachranka Village, Poland, CD, ISBN 978-1-4673-6319-8-13- 2013 IEEE. DOI 10.1109/SPS.2013.6623621

46. Koprinkova-Hristova P., K. Alexiev, D. Borisova, G. Jelev, V. Atanassov. Recurrent neural networks for automatic clustering of multispectral satellite images. In: Proc. of Image and Signal Processing for Remote Sensing XIX, SPIE, DOI 10.1117/12.2029191

Peer Reviewed Papers without DOI – AComIn project, period 1 (months 1-18)

Publications in journals and publisher series

1. Popchev I., V. Angelova, Condition numbers and local perturbation bounds for the matrix equation X + A^H X^s +/- A^H X^t A = Q. Comptes rendus de l'Academie bulgare des Sciences, 2013, Vol. 66, No 1, ISSN: 1310-1331, pp. 21-28. IF 0,212

2. Popchev I., V. Angelova, Residual bound of the matrix equation X + A^H X^{-1}A + B^H X^{-1}B = I. Comptes rendus de l'Academie bulgare des Sciences, 2013, Vol. 66, No 10, ISSN: 1310-1331, pp. 1379-1384. IF 0,212

3. Savov S., I. Popchev, Non-iterative improvement of trace bounds for the Lyapunov equation solution. Comptes rendus de l'Academie bulgare des Sciences, 2013, Vol. 66, No 5, ISSN: 1310-1331, pp. 733-738. IF 0,212

4. Vassileva, S., L. Doukovska, and V. Sgurev. AI-Based Diagnostics for Fault Detection and Isolation in Process Equipment Service. Computing and Informatics, Vol. 33, 2014, pp. 1001-1022, ISSN: 1335-9150, Slovakia

5. Borissova, D., I. Mustakerov, An algorithm for an optimal staffing problem in open shop environment. World Academy of Science, Engineering and Technology, pISSN 2010-376X, eISSN 2010-3778, Vol. 76, 2013, pp. 46-50. Available online at: http://waset.org/publications/1149/an-algorithm-for-an-optimal-staffing-problem-in-open-shop-environment

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In Section 4 we discuss the Performance indicators of AComIn and present an Assessment of project achievements in terms of the indicators. Here we only note that the List of papers, given above, implies 5% increase of the IICT research productivity for 2013.

2.3 WP2: Infrastructure upgrade by purchasing Smart Lab

The AComIn equipment, called Smart Lab, is viewed as advanced ′periphery′ (in a broad sense) to the High-Performance Computational Core of the institute (see Fig. 1). IICT needs modern devices to acquire data about objects and processes that might be of interest for the Bulgarian high-tech industry. These devices ensure the ′data autonomy′ of IICT (flow of real-world data for IICT research tasks) as they enable highly innovative scientific activities related to material sciences, energy, health, industrial control and optimisation etc. Thus IICT extends significantly its research expertise, tackling a broad range of advanced tasks, and will develop innovation capacity in hot ICT areas.

In period 1, IICT-BAS has conducted Tender 1 - an open public procurement procedure during AComIn months 6–10 (March–July 2013), which led to the purchase of most SmartLab devices via

public tendering. This procedure specified the Smart Lab equipment into 12 positions listed here with short titles:

(i) Visual wall,
(ii) Industrial tomography,
(iii) 3D scanner,
(iv) Infrared thermo camera,
(v) Acoustic holography,
(vi) High speed camera,
(vii) Laser particle sizer,
(viii) Software package,
(ix) Modular smart storage,
(x) 3D printer,
(xi) Integrating Server (hardware as well as software for simulation),
(xii) Speech Lab (installation of isolation plus devices).

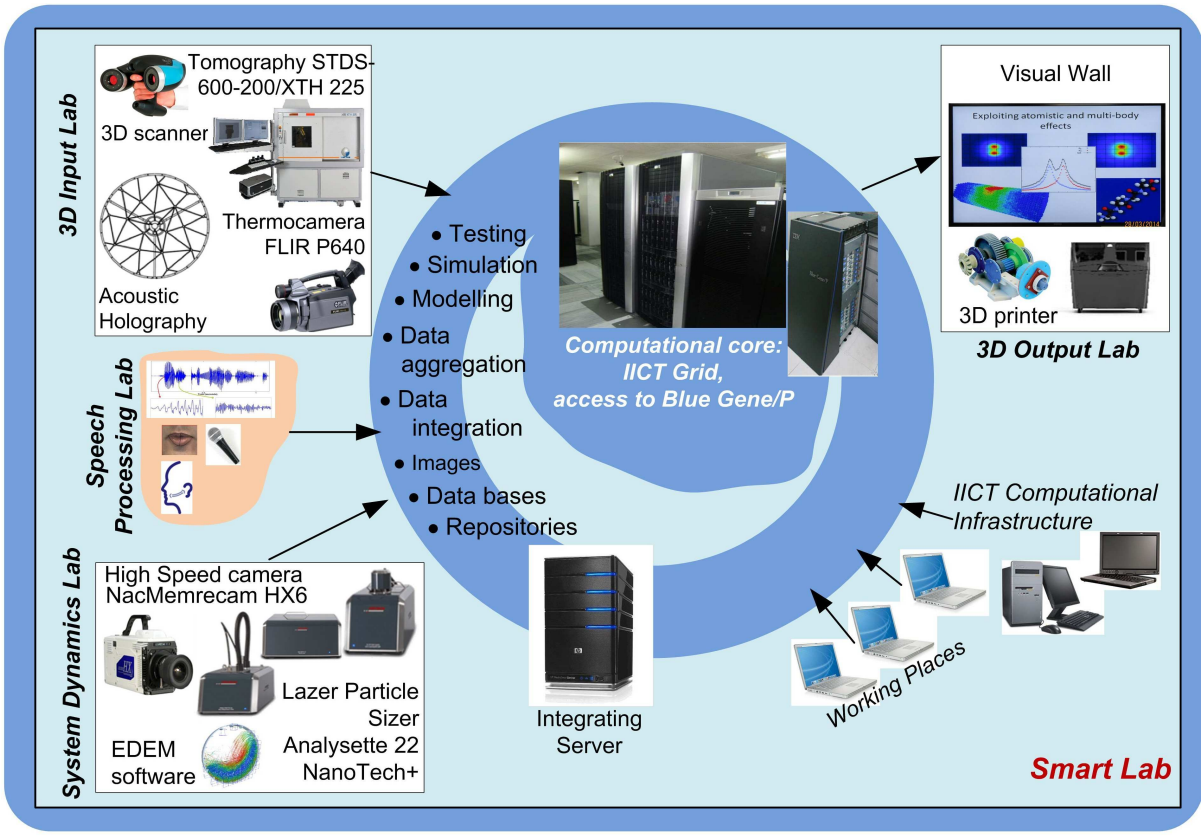

Figure 1. Smart Lab with the original devices purchased at AComIn Tenders 1 and 2

Tender 1 was successfully completed for positions *(i)* – *(ix)* despite the complexity of the devices, the high requirements of the specifications, the strict requirements for the providers and the slow and inflexible administrative procedures. Thus (75% of) Smart Lab opened its doors in AComIn month 15 (December 2013) according to the project plans. In terms of resources used for the purchase of devices at Tender 1, some 86.5% of the total budget for Infrastructure Upgrade had been spent according to the DoW schedule. Further details about Tender 1 can be found in Deliverable D2.1 presented at project month 12.

For the second Public Procurement procedure Tender 2, organised in AComIn months 15-18, we split position *(xii) Speech Lab* into two items having in mind the different nature of the suppliers: (medical) devices and room isolation. Thus Tender 2, which ended in March 2014, had four positions:

(i) 3D printer,
(ii) Integrating Server (hardware as well as software for simulation),
(iii) Speech Lab (devices),
(iv) Speech Lab (delivery and installation of isolation).

By 31 March 2014 suppliers were selected for the first three positions. So by the end of AComIn Period 1, 12 out of 13 equipment positions have been successfully procured. The last remaining item is cheaper and therefore, subject to a short public procurement procedure, inviting suppliers to present offers in one week. At the end of the reporting period the AComIn equipment is in use with the exception of Speech Lab (for more details see the Deliverable D2.2, presented at month 18).

2.4 WP2: AComIn User Communities

Users in AComIn are experts or organisations in need of novel knowledge in areas covered by the IICT competences. User Communities are viewed as dynamically-growing expert groups that disseminate the AComIn results to the innovation-absorbing Bulgarian companies and institutions in the Public Sector.

Deliverable D2.3 presents three types of instruments that enable the AComIn team to collect members of User communities, keep their interest and perform further joint R&D tasks with them:

- Lectures and presentations that aim at raising the awareness about hot topics, with orientation to a broader audience and duration of 60-90 minutes, organised with the intention to collect supporters;
- Technology Transfer (TT) Workshops with focus on specific topics and deeper considerations of the subject. Five AComIn TT Workshops were organised with a duration of up to 4 days;
- Joint work with Users who have specific well-formulated Tasks, to be solved by the Smart Lab equipment and the expertise of the IICT Researchers.

At the end of the first reporting period there are two operating User Communities:

- "*3D input/output*" with two distinct sub-communities of Users who are interested respectively in:
  - primarily in the object shapes (i.e. *3D scanning and printing*) and
  - in the modeling of 3D microstructure (i.e. *the tomography*).
- "*Microstructure dynamics*" for studying changes in the microstructures of various materials and objects when different processes affect them.

Several new groups of AComIn supporters in various areas were formed:

- *Thermography*,
- *Medical imaging and biometrics*,
- *Industrial mathematics* and
- *Intelligent management of digital and electronic content*.

Further details about User Communities are available in Deliverable D2.3 (month 18).

2.5 WP3: Networking

During the reporting period the following networking activities were performed according to the project planning:

- 3 outgoing secondments to partnering sites were implemented;
- 29 incoming short visits were organised, for scientists from 13 countries who visited IICT in order to prepare joint papers, give lectures, train Users at Technology Transfer Workshops, and participate in the AComIn Doors Open Days;
- 8 outgoing short visits of IICT experienced scientists were implemented, in order to write joint papers, to give invited talks at seminars, as well as to visit project partners and prepare future joint work;
- 32 experienced researchers participated in 33 international scientific events (31 of them peer-reviewed conferences and workshops, one European Exhibition with reviewed exhibits and one Lab Surfing Event of a FET-oriented project for Young researchers). In total, these researchers gave 64 presentations and 54 papers were published in event Proceedings;
- 11 visits of IICT experienced researchers to eight information events were implemented.

Deliverable D3.1 considers the Networking activities in project months 1-18 and presents their scientific dimensions.

2.6 WP4: Innovation activities

During the reporting period the following innovation activities were performed in AComIn:

- Lectures on Intellectual Property Rights issues were organised, to support the process of innovation capacity building in IICT;
- IICT received from the Patent Office of the Republic of Bulgaria two Certificates for registration of industrial design #7826 and #7827 for night vision devices of monocular type based on light enhancement technology using image intensifier tube;
- A Bulgarian Patent Application (Karastoyanov D., Yachev I., Hinov K., Balabosov Y., *Braille display*, Bulgarian Patent Application No 111638, 29.11.2013) is prepared for PCT submission; It will be registered in the World Intellectual Property Organisation within one year after the date of the Bulgarian registration (i.e. by 29.11.2014);
- Six projects, submitted with Bulgarian SMEs to the Operational Programme Competitiveness to a Call for increasing the research potential of SMEs, run currently in IICT and compliment the know-how mission of AComIn;
- Collaboration with the external AComIn consultant Dr Frank Heemskerk is in progress, he is helping with the development of IICT Regulatory documents regarding Innovation Activities;
- AComIn continuously proposes Regulatory documents to the IICT Governing Bodies. A first version of “Innovation Strategy of IICT” was developed as well as Suggestions for tuning it to the best EU practices (included in Deliverable D4.1, month 12). AComIn proposes a set of principles that form the basis of the IICT Intellectual Property Policy as well as a draft Plan for exploitation and dissemination of research results in IICT. These documents are to be considered and adopted by the IICT Scientific Council as a framework of Innovation Supporting Regulations.

Further details about Innovation Activities are available in Deliverable D4.2 (month 18).

2.7 WP5: Dissemination activities

During the reporting period the dissemination activities were performed according to the project planning:

- The web-site of the project is regularly updated. A button APPRECIATION was added recently to the front page, to reflect the visit of the President of the Republic of Bulgaria – Mr Rossen Plevneliev to IICT on 10th February 2014 as well as the visit of Mr Wolfgang Burtscher, Deputy Director General of DG Research and Innovation, European Commission, who visited IICT-BAS on 17th February 2014;
- The project results were disseminated to a broad scientific audience within 5 scientific events that received partial AComIn support: two of them belong to world-wide renowned series of International Forums - Large Scale Scientific Computations (LSSC) and Recent Advances in Natural Language Processing (RANLP); the other 3 events are Workshops oriented mainly towards Bulgarian academic and industrial communities;
- 6 Technology Transfer Seminars were organised (actually 5, as one in January 2014 was a continuation of a Workshop held in July 2013);
- A non-scientific Stakeholder meeting was organised in January 2013;
- An Information Day was organised along with the Second Steering Committee Meeting. It was aimed at demonstrating the project achievement and obtaining a professional evaluation of the project progress from the project partners;
- The Doors Open Days were organised on 28-29 March 2013 as a wide-scale dissemination event aiming at demonstrating the potential the Smart Lab equipment and attracting young researchers from near-by countries to apply for post-docs positions in IICT-BAS;
- 3issues of the AComIn (e-)Newsletter were published in English and Bulgarian. Leaflets and posters are regularly updated and disseminated both in English and Bulgarian.

The AComIn project is visible in Bulgaria as 3 TV emissions of nation-wide TV channels as well as a newspaper article have presented it. Further details of the various dissemination events and materials can be found in D5.1.

2.8 WP7: Major management activities

Beyond the everyday management tasks that ensure smooth workflow, the Management team esp. the Executive Board performed the following major activities:

- Organisation of the Kick off meeting in October 2012;
- Issuing the Minutes of the Kick off meeting;
- Delivery of D7.1 *Detailed Implementation Plan* (m2);
- Delivery of D7.2 *Project Handbook* (m3);
- Organisation of the Steering Committee meeting after year 1 in October 2013;
- Delivery of D7.3 *Steering Committee Conclusions regarding year 1* (m12);
- Organisation of a Public Procurement procedure (December 2012 – May 2013) for selecting a Travel Bureau to provide airplane tickets for all AComIn travels;
- Organisation of Tender 1 - a Public Procurement procedure (March – July 2013) for purchasing the Smart Lab equipment;

- Organisation of Tender 2 - a Public Procurement procedure (December 2013 – March 2014) for purchasing the Smart Lab equipment;
- Organisation of a Public Procurement procedure (February – March 2014, invitation for offers with 1 week duration) for selecting a producing company to make the 3 movies that will advertise AComIn.

The Deliverables D7.1, D7.2 and D7.3 are available in the Team Area of AComIn site. All the documentation related to the public procurement procedures in IICT is uploaded at the institute site at URL http://www.iict.bas.bg/op.html (in Bulgarian language).

3 MILESTONES FOR ACOMIN PERIOD 1

During the first reporting period of AComIn two milestones are planned to be reached:

M1 Establishment (month 12) fixes the following progress indicators:

- *All positions for recruited scientists filled;*
- *Equipment procured and installed according to plan;*
- *Core User Community members identified*.

M1 (month 12) concerns WP1, WP2, WP4, and WP7. The following progress was achieved in m.12:

- WP1: Five positions for incoming post-docs were filled (out of seven). The delay of Smart Lab installation esp. the tomography prohibited active RTD activities in certain AComIn areas and respective active campaign for searching post-doctoral researchers in these areas;
- WP2: Most of the Smart Lab equipment was procured (75% of the positions that cost some 86.5% of the total budget for Infrastructure Upgrade). Six devices (out of 9 procured at Tender 1) were delivered and operational after suitable training by the end of month 12;
- WP2: Core User Community members were identified, moreover two Technology Transfer Workshops were organised in project months 10th and 12th. Therefore the activities with Users met the M1 requirements;
- WP4: Six innovation-oriented projects with SMEs were started in the Operational Programmes. Innovation activities are developing according to the plan;
- WP7 presented all its deliverables according to the DoW schedule and performed the required tasks in tender management.

M2 AComIn fully operational (month 18) fixes the following progress indicators:

- *Smart Lab running flawlessly;*
- *Newly recruited staff fully integrated;*
- *User Communities growing and active;*
- *Networking and Dissemination according to plan*.

M2 (month) 18 concerns WP1, WP2, WP3, WP4, WP5, and WP7. The results of AComIn activities connected with this milestone are as follows:

- WP1: Six positions for incoming post-docs were filled. The integration of the recruited incoming post-docs in the IICT research environment is demonstrated by their excellent achievements and considerable number of high-quality publications (see Deliverable D1.1);

- WP2: Smart Lab runs flawlessly except the Integrating Server, the 3D Printer and the Speech Lab (i.e. 75% of the devices). But the Integrating Server, 3D Printer and Speech Lab devices were procured and contracted with the selected providers at month 18 (see Deliverable D2.2);
- WP2: The growth of User communities is rising with the increased interest to the knowledge and technology transfers, connected with the Smart Lab resources Numerous research applications of the Smart Lab equipment were demonstrated at the Industrial Mathematics Technology Transfer Seminar on 19 December 2013 and the AComIn Doors Open Days on 28-29 March 2014 (see Deliverable D2.3);
- WP3: The Networking has delay in the implementation of secondments (see D3.1 and the Contingency Plan in the Periodic Progress Report for month 18);
- WP4: Innovation activities run timely according to the schedule (see D4.1);
- WP5: Dissemination activities follow the project plans (see D5.1);
- WP7: Management activities follow the DoW schedule.

4 ASSESSMENT OF PERIOD 1 PERFORMANCE

The Technical Annex of AComIn (part B, page 10) introduces measurable Performance Indicators for assessing the project success. The comparison is based on figures from the IICT Annual Report for 2011 and the achieved progress is measured in terms of the last IICT Annual Report for 2013. We present here an Assessment of the AComIn (intermediate) results achieved for month 18:

(i) ***Research productivity:*** *increase of the number and quality of scientific publications by 10%, based on the IICT Annual Report for 2011*. The figures are:

- The reported IICT scientific publications for 2013 are 360. This is 5% increase compared to the related 343 publications for 2011. The figures for publications with IF /Web of Science/ or SJR impact rank /SCOPUS/ is: 163 for 2013 and 108 for 2011, i.e. there is 51% increase. In other words, AComIn meets at its mid-term the half of the planned publication increase (10%). But the quality of the present publications is substantially better, which exceeds the expectations fixed in the Performance indicators from 2011;
- The number of citations for 2013 is 660 which mean 91% increase compared to the number of 344 citations for 2011.

The conclusion is that we are fully in line with the expected/planned number of publications with much better results for the qualitative indicators, such as publications in highly ranked journals/volumes and the reported citations. This is partly due to the recruitment of the incoming experienced researchers but also to the general spirit of active work, cooperation and vitality catalysed by AComIn.

(ii) ***Relevance to the socio-economic needs***: *the number of contacts with industrial, governmental and NGO users and clients will be increased by 15% via contracts, established during AComIn*. *The number of joint development initiatives will be increased by at least 8-10 new initiatives starting within AComIn. As a baseline the number of IICT applied projects and contracts in 2011 will be used: 5 projects, funded by the Bulgarian SMEs Promotion Agency and 10 contracts for industrial research, funded by Bulgarian companies.* The figures in this respect are:

According to the IICT Annual Report for 2013, IICT (as a partner of innovative Bulgarian SMEs) participates in 13 projects funded via the Operational Programme “Development of the Competitiveness of the Bulgarian Economy”. This is 160 % increase, or at least 120%, if we count only the 6 running projects that are focused strictly on the AComIn topics (see D4.2). IICT has in 2013 11 contracts for industrial research, funded directly by Bulgarian companies (10% increase).

(iii) ***Human Resources***: *the number of recruited foreign incoming researchers will be increased by 4 and the number of repatriated Bulgarian researchers by 3 (according to the positions planned for long-term employment)*.

The number of recruited incoming post-docs with long-term contract is 2 foreigners and 3 Bulgarians – so the indicator is satisfied given that we assess the performance of AComIn in month 18.

The number of defended PhD theses will be increased by at least 20% (in 2011 3 PhD theses were defended in IICT).

In 2012, 6 PhD theses were defended in IICT and in 2013 – 7 PhD theses. This is two times more compared to the respective number of 3 theses for 2011.

(iv) ***Innovation impact***: *The number of patent applications, submitted within AComIn, will be at least 4. The software licenses will be at least 3. The User Communities will comprise hundreds of industrial experts*.

IICT was granted two certificates of industrial design in 2013. One Bulgarian patent, received in 2013, is currently in a process of extension to a WIPO application. The User Communities comprise at present dozens of industrial members and the number is growing rather fast. Moreover, company representatives from the neighboring countries attend the demonstrations of the SmartLab devices, so Users from abroad are expected soon.

(v) ***Social impact***: *There will be hundreds of visitors at the Doors Open Days and attendees at the Information Days and Stakeholders meetings. There will be dozens of media reactions to the AComIn dissemination efforts.*

There are already hundreds of visitors at the Doors Open Days (120 visitors from 30 academic and industrial organisations) and dozens of attendees at the Technology Transfer Workshops, Information Days and Stakeholders meetings. Among the visitors we can count also the President of the Republic of Bulgaria Mr. Rossen Plevneliev and Mr Wolfgang Burtscher, Deputy Director General of DG Research and Innovation, European Commission. There are numerous media reactions to the AComIn dissemination actions, including 3 TV reportages of nation-wide TV channels and 1 longer newspaper article. The Lists of Participants in the Technology Transfer Workshops are uploaded in the Team Area of AComIn site, under *Reports* / *WP5*.

5 DEVIATIONS FROM SCHEDULE AND CONTINGENCY PLAN

The deviations from the AComIn schedule concern three WPs:

WP1: *utilization of less person-months than the planned employments of incoming experienced researchers, both for the long-term and short-term recruitments*. The delay is due to two main reasons:

- the equipment delivery has been relatively slow and the full Smart Lab integration is delayed by several months. The delay is also due to the complexity of the high-tech devices as it takes time to train experts in their exploitation (appointment is difficult because of their novelty);
- it takes time to organise visits of incoming experienced researchers who usually plan their schedule some years in advance. Please note that IICT has quite high requirements for the selection of incoming post-doctoral researchers.

Meanwhile there are contingency plans on how to overcome the delay. Three post-doctoral candidates for long-term employment are principally approved at the end of reporting period 1. One of them is waiting now for an EU working visa. A detailed contingency plan is presented in the First project progress report.

WP2: *slow purchase of 3 positions in the Smart Lab device list*. Tender 1 for Smart Lab purchase ended in August 2013 (project month 11) so nine devices were delivered to IICT by the end of November 2013. Thus (75% of) Smart Lab was available in December 2013, precisely as scheduled, but the IICT experts still continue to study in depth the full potential of the novel high-tech equipment.

The remaining 3 items were procured in a public procedure where one position was split into two for easier submission of offers. This Tender 2 was run between December 2013 and March 2014, and another 3 positions were successfully procured. So by the end of Period 1, 12 out of 13 equipment positions have been successfully procured.

The last remaining item, belonging to the Speech Lab, is cheaper and therefore, subject to a short public procurement procedure, inviting suppliers to present offers in one week. We note that the delay of Speech Lab purchase is insignificant for the other Smart Lab devices because the Speech Lab is a stand-alone installation. Further details in this respect are presented in D2.2 and the First project progress report.

WP3: *delayed implementation of Secondments to/from the six international project partners*. It is mostly due to the overload of the highly skilled international partners, who need several months (if not years) to plan visits of guests to their premises. The coordination of the Work programmes for the visiting scholars takes time as well. The experienced IICT researchers also need some time to prepare detachments from their duties that often include lecturing.

The First project progress report contains a detailed contingency plan for implementation of all secondments in the second AComIn period. Only in May-June 2014 six one-month secondments to three international partners will be implemented.

There are no deviations from the scheduled activities in WP4 (*Innovation capacity building*), WP5 (*Dissemination*) and WP7 (*Management*). The work package WP6 (*Review by independent external experts*) is not operational during the first project period months 1-18.

Having in mind that the delays in the WP1, WP2 and WP3 schedule can be overcome, we conclude, that in project period 1

> **AComIn has achieved most of its objectives and technical goals for the period with relatively minor deviations**.

Please note that the delay of the Tenders in WP2 was almost inevitable due to the complex procedures, on the one hand, and the Academy context where few legal experts are overloaded with many responsibilities, on the other hand. These circumstances (more or less) influence the tempo of AComIn activities in WP2 and indirectly, the activities of WP1 and WP3 because the equipment-dependent tasks need to be postponed.

6 CONCLUSIONS

After recruiting most of the incoming post-docs and purchasing most of the Smart Lab equipment, AComIn is moving now with acceleration.

Solid research results have been achieved in period 1 and the project delivers a long list with 123 high-quality publications. These research results will imply more active conference participation in the second project period.

Blooming User Communities have been built in two areas and the activities for extension of the User-oriented tasks are in progress.

The secondment plans are justified with the international partners and the mobilities will be implemented in the next 18 months.

The AComIn dissemination events are attended by hundreds of participants. The project is visible and attracts a lot of attention: in February 2014 the President of the Republic of Bulgaria Mr. Rossen Plevneliev and Mr Wolfgang Burtscher, Deputy Director General of DG Research and Innovation, European Commission visited IICT (the Bulgarian FP7 leader).

In this way AComIn enters in its second period with clear targets, accumulated good practices and a vision for achieving successfully the project objectives.