

mipro 2016

ISSN 1847-3938

organizer

μpro



39th

international convention

May 30 - June 03, 2016, Opatija – Adriatic Coast, Croatia

Lampadem tradere



mipro - path to knowledge and innovation

mipro proceedings

My profession. My organization. My IEEE.



Discover the benefits of IEEE membership.

Join a community of more than 365,000 innovators in over 150 countries. IEEE is the world's largest technical society, providing members with access to the latest technical information and research, global networking and career opportunities, and exclusive discounts on education and insurance products.

Join today
www.ieee.org/join



MIPRO 2016

39th International Convention

**May 30 – June 03, 2016
Opatija, Croatia**

Proceedings

Conferences:

Microelectronics, Electronics and Electronic Technology /MEET

**Distributed Computing, Visualization and Biomedical
Engineering /DC VIS**

Telecommunications & Information /CTI

Special Session on Future Networks and Services /FNS

Computers in Education /CE

Computers in Technical Systems /CTS

Intelligent Systems /CIS

**Special Session on Biometrics & Forensics & De-Identification and
Privacy Protection /BiForD**

Information Systems Security /ISS

Business Intelligence Systems /miproBIS

**Digital Economy and Government, Local Government, Public
Services / DE-GLGPS**

MIPRO Junior - Student Papers /SP

Edited by:
Petar Biljanović

International Program Committee

Petar Biljanović, General Chair, Croatia

S. Amon, Slovenia

V. Andelić, Croatia

M.E. Auer, Austria

M. Baranović, Croatia

A. Badnjević, Bosnia and Herzegovina

B. Bebel, Poland

L. Bellatreche, France

E. Brenner, Austria

A. Budin, Croatia

Ž. Butković, Croatia

Ž. Car, Croatia

M. Colnarič, Slovenia

A. Cuzzocrea, Italy

M. Čičin-Šain, Croatia

M. Delimar, Croatia

T. Eavis, Canada

M. Ferrari, Italy

B. Fetaji, Macedonia

T. Galinac Grbac, Croatia

P. Garza, Italy

L. Gavrilovska, Macedonia

M. Golfarelli, Italy

S. Golubić, Croatia

F. Gregoretti, Italy

S. Groš, Croatia

N. Guid, Slovenia

Y. Guo, United Kingdom

J. Henno, Estonia

L. Hluchy, Slovakia

V. Hudek, Croatia

Ž. Hutinski, Croatia

M. Ivanda, Croatia

H. Jaakkola, Finland

L. Jelenković, Croatia

D. Jevtić, Croatia

R. Jones, Switzerland

P. Kacsuk, Hungary

A. Karaivanova, Bulgaria

M. Mauher, Croatia

I. Mekjavić, Slovenia

B. Mikac, Croatia

V. Milutinović, Serbia

V. Mrvoš, Croatia

J.F. Novak, Croatia

J. Pardillo, Spain

N. Pavešić, Slovenia

V. Peršić, Croatia

T. Pokrajčić, Croatia

S. Ribarić, Croatia

J. Rozman, Slovenia

K. Skala, Croatia

I. Sluganović, Croatia

V. Sruk, Croatia

U. Stanič, Slovenia

N. Stojadinović, Serbia

J. Sunde, Australia

A. Szabo, IEEE Croatia Section

L. Szirmay-Kalos, Hungary

D. Šarić, Croatia

D. Šimunić, Croatia

Z. Šimunić, Croatia

D. Škvorc, Croatia

A. Teixeira, Portugal

E. Tijan, Croatia

A.M. Tjoa, Austria

R. Trobec, Slovenia

S. Uran, Croatia

T. Vámos, Hungary

M. Varga, Croatia

M. Vidas-Bubanja, Serbia

B. Vrdoljak, Croatia

D. Zazula, Slovenia

organized by
MIPRO Croatian Society

technical cosponsorship
IEEE Region 8

under the auspices of
Ministry of Science, Education and Sports of the Republic of Croatia
Ministry of Maritime Affairs, Transport and Infrastructure of the Republic of Croatia
Ministry of Entrepreneurship and Crafts of the Republic of Croatia
Ministry of Public Administration of the Republic of Croatia
Croatian Chamber of Economy
Primorsko-goranska County
City of Rijeka
City of Opatija
Croatian Regulatory Authority for Network Industries
Croatian Power Exchange - CROPEX

patrons
University of Rijeka, Croatia
University of Zagreb, Croatia
IEEE Croatia Section
IEEE Croatia Section Computer Chapter
IEEE Croatia Section Electron Devices/Solid-State Circuits Joint Chapter
IEEE Croatia Section Education Chapter
IEEE Croatia Section Communications Chapter
T-Croatian Telecom, Zagreb, Croatia
Ericsson Nikola Tesla, Zagreb, Croatia
Končar - Electrical Industries, Zagreb, Croatia
HEP - Croatian Electricity Company, Zagreb, Croatia
VIPnet, Zagreb, Croatia
University of Zagreb, Faculty of Electrical Engineering and Computing, Croatia
Ruđer Bošković Institute, Zagreb, Croatia
University of Rijeka, Faculty of Maritime Studies, Croatia
University of Rijeka, Faculty of Engineering, Croatia
University of Rijeka, Faculty of Economics, Croatia
University of Zagreb, Faculty of Organization and Informatics, Varaždin, Croatia
University of Rijeka, Faculty of Tourism and Hospitality Management, Opatija, Croatia
Polytechnic of Zagreb, Croatia
EuroCloud Croatia
Croatian Regulatory Authority for Network Industries, Zagreb, Croatia
Croatian Post, Zagreb, Croatia
Erste&Steiermärkische bank, Rijeka, Croatia
Selmet, Zagreb, Croatia
CISEx, Zagreb, Croatia
Kermas energija, Zagreb, Croatia
Rezultanta, Zagreb, Croatia
River Publishers, Aalborg, Denmark

sponsors
Ericsson Nikola Tesla, Zagreb, Croatia
T-Croatian Telecom, Zagreb, Croatia
Končar-Electrical Industries, Zagreb, Croatia
HEP - Croatian Electricity Company, Zagreb, Croatia
InfoDom, Zagreb, Croatia
Hewlett Packard Croatia, Zagreb, Croatia
IN2, Zagreb, Croatia
Transmitters and Communications Company, Zagreb, Croatia
Storm Computers, Zagreb, Croatia
Nokia, Zagreb, Croatia
VIPnet, Zagreb, Croatia
King-ICT, Zagreb, Croatia
Microsoft Croatia, Zagreb, Croatia
Micro-Link, Zagreb, Croatia
Mjerne tehnologije, Zagreb, Croatia
Altpro, Zagreb, Croatia
Danieli Automation, Buttrio, Italy
Selmet, Zagreb, Croatia
ib-proCADD, Ljubljana, Slovenia
Nomen, Rijeka, Croatia

All papers are published in their original form

For Publisher:

Petar Biljanović

Publisher:

Croatian Society for Information and Communication Technology,
Electronics and Microelectronics - **MIPRO**
Office: Kružna 8/II, P. O. Box 303, HR-51001 Rijeka, Croatia
Phone/Fax: (+385) 51 423 984

Printed by:

GRAFIK, Rijeka

ISBN 978-953-233-087-8

Copyright © 2016 by MIPRO

All rights reserved. No part of this book may be reproduced in any form, nor may be stored in a retrieval system or transmitted in any form, without written permission from the publisher.

CONTENTS

LIST OF PAPER REVIEWERS

LIST OF AUTORS

FOREWORD

MICROELECTRONICS, ELECTRONICS AND ELECTRONIC TECHNOLOGY

INVITED PAPER

- (Si)GeSn Nanostructures for Optoelectronic Device Applications 5**
I.A. Fischer, F. Oliveira, A. Benedetti, S. Chiussi, J. Schulze

PAPERS

- Thermoelectric Properties of Polycrystalline WS₂ and Solid Solutions of WS_{2-y}Se_y Types 11**
G.E. Yakovleva, A.I. Romanenko, A.S. Berdinsky, A.Yu. Ledneva, V.A. Kuznetsov, M.K. Han, S.J. Kim, V.E. Fedorov

- Piezoresistive Effect in Polycrystalline Bulk and Film Layered Sulphide W_{0.95}Re_{0.05}S₂ 16**
V.A. Kuznetsov, A.I. Romanenko, A.S. Berdinsky, A.Yu. Ledneva, S.B. Artemkina, V.E. Fedorov

- Luminescent Diagnostics in the NIR-region on a Base of Yb-porphyrin Complexes 20**
V.D. Rummyantseva, I.P. Shilov, Yu.V. Alekseev, A.S. Gorshkova

- Simulation Study of the Composite Silicon Solar Cell Efficiency Sensitivity to the Absorption Coefficients and the Thickness of intrinsic Absorber Layer 24**
V. Tudić, N. Posavec

- The Investigation of Influence of Localized States on a-Si:H p-i-n Photodiode Transient Response to Blue Light Impulse with Blue Light Optical Bias 30**
M. Čović, V. Gradišnik, Ž. Jeričević

- Analysis of Electrical and Optical Characteristics of InP/InGaAs Avalanche Photodiodes in Linear Regime by a New Simulation Environment 34**
T. Knežević, T. Suligoj

Design of Passive-Quenching Active-Reset Circuit with Adjustable Hold-Off Time for Single-Photon Avalanche Diodes	40
I. Berdalović, Ž. Osrečki, F. Šegmanović, D. Grubišić, T. Knežević, T. Suligoj	
Impact of the Emitter Polysilicon Thickness on the Performance of High-Linearity Mixers with Horizontal Current Bipolar Transistors	46
J. Žilak, M. Koričić, H. Mochizuki, S. Morita, T. Suligoj	
Fully-integrated Voltage Controlled Oscillator in Low-cost HCBT Technology	51
M. Koričić, J. Žilak, H. Mochizuki, S. Morita, T. Suligoj	
Variable-Gain Amplifier for Ultra-Low Voltage Applications in 130nm CMOS Technology	57
D. Arbet, M. Kováč, L. Nagy, V. Stopjaková, M. Šovčík	
Relaxation Oscillator Calibration Technique with Comparator Delay Regulation	63
J. Mikulić, G. Schatzberger, A. Barić	
A Bootstrap Circuit for DC–DC Converters with a Wide Input Voltage Range in HV-CMOS	68
N. Mitrović, R. Enne, H. Zimmermann	
A Fractional-N Subsampling PLL based on a Digital-to-Time Converter	72
N. Markulic, K. Raczkowski, P. Wambacq, J. Craninckx	
Infrared Protection System for High-Voltage Testing of SiC and GaN FETs used in DC-DC Converters	78
F. Hormot, J. Bačmaga, A. Barić	
Optimal Conduction Angle of an E-PHEMT Harmonic Frequency Multiplier	82
K. Martinčić	
Ultra-Wideband Transmitter Based on Integral Pulse Frequency Modulator	86
T. Matić, M. Herceg, J. Job, L. Šneler	
Design of a Transmitter for High-Speed Serial Interfaces in Automotive Micro-Controller	90
A. Bandiziol, W. Grollitsch, F. Brandonisio, R. Nonis, P. Palestri	
Application of the Calculation-Experimental Method in the Design of Microwave Filters	95
A.S. Geraskin, A.N. Savin, I.A. Nakrap, V.P. Meshchanov	
Minimax Design of Multiplierless Sharpened CIC Filters Based on Interval Analysis	100
G. Molnar, A. Dudarin, M. Vučić	

Minimization of Maximum Electric Field in High-Voltage Parallel-Plate Capacitor	105
R. Blečić, Q. Diduck, A. Barić	
Modelling SMD Capacitors by Measurements	110
R. Mišlov, M. Magerl, S. Fratte-Sumper, B. Weiss, C. Stockreiter, A. Barić	
Impact of Capacitor Dielectric Type on the Performance of Wireless Power Transfer System	116
D. Vinko, P. Oršolić	
Switching Speed and Stress Analysis for Fixed-fixed Beam Based Shunt Capacitive RF MEMS Switches	120
A. Kumar A., R. R	
Performance Analysis of Micromirrors - Lift-off and von Mises Stress	126
S. Finny, R. R	
Material and Orientation Optimization for Quality Factor Enhancement of BAW Resonators	130
R. Raj R.S., R. R	
Impact of Propagation Medium on Link Quality for Underwater and Underground Sensors	135
G. Horvat, D. Vinko, J. Vlaović	
Electrical Field Intensity Model on the Surface of Human Body for Localization of Wireless Endoscopy Pill	141
B. Lukovac, A. Koren, A. Marinčić, D. Šimunić	
Wide Band Current Transducers in Power Measurement Methods - an Overview	146
R. Malarić, Ž. Martinović, M. Dadić, P. Mostarac, Ž. Martinović	
Laboratory Model for Design and Verification of Synchronous Generator Excitation Control Algorithms	152
S. Tusun, I. Erceg, I. Sirotić	
The European Project SolarDesign Illustrating the Role of Standardization in the Innovation System	158
W. Brenner, N. Adamovic	
Open Public Design Methodology and Design Process	164
D. Rembold, S. Jovalekic	

DISTRIBUTED COMPUTING, VISUALIZATION AND BIOMEDICAL ENGINEERING

INVITED PAPER

Views on the Role and Importance of Dew Computing in the Service and Control Technology	175
Z. Šojat, K. Skala	

PAPERS

DISTRIBUTED COMPUTING AND CLOUD COMPUTING

Parameters That Affect the Parallel Execution Speed of Programs in Multi-Core Processor Computers	185
V. Xhafa, F. Dika	
Federated Computing on the Web: the UNICORE Portal	190
M. Petrova-El Sayed, K. Benedyczak, A. Rutkowski, B. Schuller	
Problem-Oriented Scheduling of Cloud Applications: PO-HEFT Algorithm Case Study	196
E.A. Nepovinnykh, G.I. Radchenko	
Towards a Novel Infrastructure for Conducting High Productive Cloud-Based Scientific Analytics	202
P. Brezany, T. Ludescher, T. Feilhauer	
An OpenMP Runtime Profiler/Configuration Tool for Dynamic Optimization of the Number of Threads	208
T. Dancheva, M. Gusev, V. Zdravevski, S. Ristov	
An Effective Task Scheduling Strategy in Multiple Data Centers in Cloud Scientific Workflow	214
E.I. Djebbar, G. Belalem	
Visualisation in the ECG QRS Detection Algorithms	218
A. Ristovski, A. Guseva, M. Gusev, S. Ristov	
Analysis and Comparison of Algorithms in Advanced Web Clusters Solutions	224
D. Alagić, K. Arbanas	
Metamodeling as an Approach for Better Computer Resources Allocation in Web Clusters	230
D. Alagić, D. Maček	

Showers Prediction by WRF Model above Complex Terrain	236
T. Davitashvili, N. Kutaladze, R. Kvatadze, G. Mikuchadze, Z. Modebadze, I. Samkharadze	
Methods and Tools to Increase Fault Tolerance of High-Performance Computing Systems	242
I.A. Sidorov	
Logical-Probabilistic Analysis of Distributed Computing Reliability	247
A.G. Feoktistov, I.A. Sidorov	
Distributed Graph Reduction Algorithm with Parallel Rigidity Maintenance	253
D. Sušanj, D. Arbula	
Architecture of Virtualized Computational Resource Allocation on SDN-enhanced Job Management System Framework	257
Y. Watashiba, S. Date, H. Abe, K. Ichikawa, Y. Kido, H. Yamanaka, E. Kawai, S. Shimojo	
Near Real-time Detection of Crisis Situations	263
S. Girtelschmid, A. Salfinger, B. Pröll, W. Retschitzegger, W. Schwinger	
Automatic Protocol Based Intervention Plan Analysis in Healthcare	269
M. Kozlovsky, L. Kovács, K. Batbayar, Z. Garaguly	
Using Fourier and Hartley Transform for Fast, Approximate Solution of Dense Linear Systems	274
Ž. Jeričević, I. Kožar	
Procedural Generation of Mediterranean Environments	277
N. Mikuličić, Ž. Mihajlović	
Energy-Aware Power Management of Virtualized Multi-core Servers through DVFS and CPU Consolidation	283
H. Rostamzadeh Hajilari, M.M. Talebi, M. Sharifi	
Human Posture Detection Based on Human Body Communication with Muti-carriers Modulation	289
W. Ni, Y. Gao, Ž. Lučev Vasić, S.H. Pun, M. Cifrek, M.I. Vai, M. Du	
SAT-Based Search for Systems of Diagonal Latin Squares in Volunteer Computing Project SAT@home	293
O. Zaikin, S. Kochemazov, A. Semenov	
Architectural Models for Deploying and Running Virtual Laboratories in the Cloud	298
E. Afgan, A. Lonie, J. Taylor, K. Skala, N. Goonasekera	
A CAD Service for Fusion Physics Codes	303
M. Telenta, L. Kos	

Correlation between Attenuation of 20 GHz Satellite Communication Link and Liquid Water Content in the Atmosphere	308
M. Kolman, G. Kosec	
Practical Implementation of Private Cloud with Traffic Optimization	314
D.G. Grozev, M.P. Shopov, N.R. Kakanakov	
Improving Data Locality for NUMA-Agnostic Numerical Libraries	320
P. Zinterhof	
Use Case Diagram Based Scenarios Design for a Biomedical Time-Series Analysis Web Platform	326
A. Jović, D. Kukulja, K. Jozić, M. Cifrek	
Augmented Reality for Substation Automation by Utilizing IEC 61850 Communication	332
M. Antonijević, S. Sučić, H. Keserica	
Innovation of the Campbell Vision Stimulator with the Use of Tablets	337
J. Brozek, M. Jakes, V. Svoboda	
Classification of Scientific Workflows Based on Reproducibility Analysis	343
A. Bánáti, P. Kacsuk, M. Kozlovsky	
Dynamic Execution of Scientific Workflows in Cloud	348
E. Kail, J. Kovács, M. Kozlovsky, P. Kacsuk	
FPGA Kernels for Classification Rule Induction	353
P. Škoda, B. Medved Rogina	
VISUALIZATION SYSTEMS	
Prototyping of Visualization Designs of 3D Vector Fields Using POV-Ray Rendering Engine	361
J. Opila	
New Cybercrime Taxonomy of Visualization of Data Mining Process	367
M. Babič, B. Jerman-Blažič	
Visual Representation of Predictions in Software Development Based on Software Metrics History Data	370
B. Popović, A. Balota, Dž. Strujić	
Interaction with Virtual Objects in a Natural Way	376
I. Prazina, K. Balić, K. Pršeš, S. Rizvić, V. Okanović	
Bone Shape Characterization Using the Fourier Transform and Edge Detection in Digital X-Ray Images	380
D. Sušan, G. Gulan, I. Kožar, Ž. Jeričević	

GIS in the e-Government Platform to Enable State Financial Subsidies Data Transparency	383
M. Kranjac, U. Sikimić, I. Simić, M. Paroški, S. Tomić	

Evaluation of Caching Techniques for Video on Demand in Named Data Networks	388
K. Jakimoski, S. Arsenovski, L. Gorachinova, S. Chungurski, O. Iliev, L. Djinevski, E. Kamcheva	

BIOMEDICAL ENGINEERING

Diagnostic of Asthma Using Fuzzy Rules Implemented in Accordance with International Guidelines and Physicians Experience	395
A. Badnjević, L. Gurbeta, M. Cifrek, D. Marjanović	

Robust Beat Detection on Noisy Differential ECG	401
P. Lavrič, M. Depolli	

Classification of Asthma Using Artificial Neural Network	407
A. Badnjević, L. Gurbeta, M. Cifrek, D. Marjanović	

Brain-Computer Interface Based on Steady-State Visual Evoked Potentials	411
K. Friganović, M. Medved, M. Cifrek	

Comparison of Wireless Electrocardiographic Monitoring and Standard ECG in Dogs	416
A. Krvavica, Š. Likar, M. Brložnik, A. Domanjko-Petrič, V. Avbelj	

A Medical Cloud	420
J. Tasič, M. Gusev, S. Ristov	

A Hospital Cloud-Based Open Archival Information System for the Efficient Management of HL7 Big Data	426
A. Celesti, M. Fazio, A. Romano, M. Villari	

Recognition and Adjustment for Strip Background Baseline in Fluorescence Immuno-chromatographic Detection System	432
Y. Gao, C. Lin, S.H. Pun, M.I. Vai, M. Du	

Agile Development of a Hospital Information System	436
S.L.R. Vrhovec	

SOA Based Interoperability Component for Healthcare Information System	442
D. Kučak, G. Đambić, V. Kokanović	

Wireless Intrabody Communication Sensor Node Realized Using PSoC Microcontroller	446
F. Grilec, Ž. Lučev Vasić, W. Ni, Y. Gao, M. Du, M. Cifrek	

Detection of Heart Rate Variability from a Wearable Differential ECG Device	450
J. Slak, G. Kosec	
Penetration of the ICT Technology to the Health Care Primary Sector – Ljubljana PILOT	456
T. Poplas Susič, U. Stanič	
Image-Based Metal Artifact Reduction in CT Images	462
A. Šerifović-Trbalić, A. Trbalić	
New Algorithm for Automatic Determination of Systolic and Diastolic Blood Pressures in Oscillometric Measurements	467
V. Jazbinšek	
TGTP-DB – a Database for Extracting Genome, Transcriptome and Proteome Data Using Taxonomy	472
K. Križanović, M. Marinović, A. Bulović, R. Vaser, M. Šikić	
Development and Perspectives of Biomedical Engineering in South East European Countries 477	
A. Badnjević, L. Gurbeta	
Clustering of Heartbeats from ECG Recordings Obtained with Wireless Body Sensors	481
A. Rashkovska, D. Kocev, R. Trobec	
Heart Rate Analysis with NevroEkg	487
M. Mohorčič, M. Depolli	

TELECOMMUNICATIONS & INFORMATION

FNS • SPECIAL SESSION ON FUTURE NETWORKS AND SERVICES

PAPERS

A Survey of IoT Cloud Providers	497
T. Pflanzner, A. Kertesz	
QoS-Aware Deployment of Data Streaming Applications over Distributed Infrastructures	503
M. Nardelli	
QoS-Aware Application Placement Over Distributed Cloud	509
F. Bianchi, F. Lo Presti	

Energy-Aware Control of Server Farms	515
M.E. Gebrehiwot, S. Aalto, P. Lassila	

SDN Based Service Provisioning Management in Smart Buildings	521
M. Tošić, O. Iković, D. Bošković	

TELECOMMUNICATIONS & INFORMATION

INVITED PAPER

Time Series Analysis and Possible Applications	531
M. Ivanović, V. Kurbalija	

PAPERS

WIRELESS COMMUNICATIONS AND TECHNOLOGIES

Wireless Resonant Power Transfer – An Overview	543
Ž. Martinović, M. Dadić, R. Malarić, Ž. Martinović	

Investigation of a Small Handheld PCB Nesting Two Antennas NFC 13.56 MHz and to RF 868 MHz	550
L.A. Iliev, I.S. Stoyanov, T.B. Iliev, E.P. Ivanova, Gr.Y. Mihaylov	

The Coverage Belt for Low Earth Orbiting Satellites	554
S. Cakaj	

The Investigation of the Effect of the Carrier Frequency Offset (CFO) in SC-FDMA System	558
N. Taşpınar, M. Balki	

Performance Analysis of Low Density Parity Check Codes Implemented in Second Generations of Digital Video Broadcasting Standards	562
Gr.Y. Mihaylov, T.B. Iliev, E.P. Ivanova, I.S. Stoyanov, L.A. Iliev	

DATA AND IMAGE ANALYSIS

Iterative Denoising of Sparse Images	569
I. Stanković, I. Orović, S. Stanković, M. Daković	

Compressive Sensing Based Image Processing in TrapView Pest Monitoring System	574
M. Marić, I. Orović, S. Stanković	

Big Data Analytics for Communication Service Providers	579
D. Šipuš	

Role of Data Analytics in Utilities Transformation	584
V. Čačković, Ž. Popović	

Using MEAN Stack for Development of GUI in Real-Time Big Data Architecture	590
M. Štajcer, M. Štajcer, D. Oreščanin	

NETWORK TECHNOLOGIES

A Survey on Physical Layer Impairments Aware Routing and Wavelength Assignment Algorithms in Transparent Wavelength Routed Optical Networks	599
H. Dizdarević, S. Dizdarević, M. Škrbić, N. Hadžiahmetović	

A Survey on Transition from GMPLS Control Plane for Optical Multilayer Networks to SDN Control Plane	606
S. Dizdarević, H. Dizdarević, M. Škrbić, N. Hadžiahmetović	

About the Telco Cloud Management Architectures	614
I. Nenadić, D. Kobal, D. Palata	

CPE Virtualization by Unifying NFV, SDN and Cloud Technologies	622
P. Cota, J. Šabec	

Soft Sensors in Wireless Networking as Enablers for SDN Based Management of Content Delivery	628
M. Tošić, O. Iković, D. Bošković	

A FIRM Approach for Software-Defined Service Composition	634
P. Kathiravelu, T. Galinac Grbac, L. Veiga	

Test Environment & Application as a Service	640
T. Žitnik, M. Galin, G. Pauković, I. Dević, R. Čižmar, Z. Bosić	

Workaround Solutions Used During PSTN Migration of Customers to IMS Network	644
N. Štokić	

Development of the Generic OFDM Based Transceiver in the LabView Software Environment	650
D. Hamidović, N. Suljanović	

The Challenge of Cellular Cooperative ITS Services Based on 5G Communications Technology	656
Z. Kljaić, P. Škorput, N. Amin	

NETWORKS PERFORMANCES

Performance Evaluation of Different Scheduling Algorithms in LTE Systems	667
A. Marinčić, D. Šimunić	

Performance Analysis of LTE Networks with Random Linear Network Coding	673
T.D. Assefa, K. Kralevska, Y. Jiang	
VoLTE E2E Performance Management	679
D. Klobučarević, Ž. Klobučarević, D. Belošić	
Balancing Security and Blocking Performance with Reconfiguration of the Elastic Optical Spectrum	684
S. Kumar Singh, W. Bziuk, A. Jukan	
Ensuring Continuous Operation of Critical Process of Remote Control System at the Level of Network Connectivity	690
I. Fosić, D. Budiša	
 IoT PLATFORM AND APPLICATIONS	
Requirements and Challenges in Wireless Network's Performance Evaluation in Ambient Assisted Living Environments	699
A. Koren, D. Šimunić	
Long Term Evolution as a Precondition for Internet of Postal Things	703
A. Kosovac, A. Veispahić, M. Berković	
Advanced Sensing and Internet of Things in Smart Cities	707
D. Capeska Bogatinoska, R. Malekian, J. Trengoska, W. Asiam Nyako	
Security Challenges of the Internet of Things	713
M. Weber, M. Boban	
Promoting Health for Chronic Conditions: a Novel Approach That Integrates Clinical and Personal Decision Support	719
I. Lasorsa, M. Ajčević, P. D'Antrassi, G. Carlini, A. Accardo, S. Marceglia	
A Taxonomy of Localization Techniques Based on Multidimensional Scaling	724
B. Risteska Stojkoska	
Distributed Real-Time Lift Kinematic Monitoring Using COTS Smartphones	730
N. Miškić-Pletenac, K. Lenac	
Mobile Devices as Authentic and Trustworthy Sources in Multi-Agent Systems	736
V. Vyroubal, A. Stančić, I. Grgurević	
 SOFTWARE ENGINEERING	
Comparative Analysis of Functional and Object-Oriented Programming	745
D. Alić, S. Omanović, V. Giedrimas	

Improving the Composition and Assembly of APIs in Service Dominant Ecosystem Environments	751
D. Ramljak	
Service Level Agreement - SLA, raspoloživost servisa i kvalitet sistema u telekomunikacijama	755
D. Glamočanin	
Challenges of a Service Transition in Multi Domain Environment	761
I. Golub, B. Radojević	
Teaching “Ten Commandments” of Software Engineering	766
Z. Putnik, M. Ivanović, Z. Budimac, K. Bothe	
Methodologies for Development of Mobile Applications	772
Z. Stapić, M. Mijač, V. Strahonja	
Upravljanje promjenama na primjeru telekom operatera u Jugoistočnoj Evropi	777
A. Gabela	
Tehnologije integracije informacijskih sustava	783
A. Stojanović, N. Lazić, Ž. Kovačević	
 TELECOM PRODUCTS, SERVICES AND MARKET	
Restructuring of Telco Products	791
I. Vrbovčan, T. Pavić, M. Šoša Anić	
Moving from Network-Centric toward Customer-Centric CSPs in Bosnia and Herzegovina	794
N. Banović-Ćurguz, D. Ilišević	
Future Communication Model: Challenges and Opportunities for Society as a Whole	800
D. Ilišević, N. Banović-Ćurguz	
Some Aspects of Network Management System for Video Service	805
O. Jukić, I. Heđi	
Influence of OTT Service Providers on Croatian Telecommunication Market	809
I. Dražić Lutitsky, M. Ivić	
Implementing Shared Service Center in Telecom Environment as More Efficient and More Cost Effective Business Model	814
T. Žilić, V. Čošić	

ICT APPLICATIONS

Usluga mobilnog plaćanja računa m:Pay	821
V. Žlof, S. Salapura	
Praćenje imovinsko pravnih poslova na elektroničkoj komunikacijskoj infrastrukturi putem Web GIS aplikacije	826
D. Salopek, T. Đigaš, F. Ambroš, M. Štimac	
Fieldbus Diagnostic Online Solution Program Establishment at Rijeka Oil Refinery	831
B. Žeželj, H. Hajdo	
Automatic Communication System Ship to Shipping Terminal, for Reporting Potential Malfunctions of a Ballast Water Treatment System Operation	836
G. Bakalar, M. Baggini	
AdriaHUB ICT platform	841
T. Škorjanc, R. Žigulić, N. Anđelić	
Mjerenje kvaliteta usluge mobilnog plaćanja m:Pay	847
S. Salapura, V. Žlof	
Uspostava sustava upravljanja identitetima u Carinskoj upravi	852
M. Hajnić, D. Cmuk	

COMPUTERS IN EDUCATION

INVITED PAPER

New Informatics Curriculum - Croatian Tradition with World Trends	863
L. Kralj	

PAPERS

Creativity, Communication and Collaboration: Grading with Open Badges	869
I. Salopek Čubrić, G. Čubrić	
A Study of Students' Attitudes and Perceptions of Digital Scientific Information Landscape	875
R. Vrana	
Researcher Measured - Towards a Measurement-driven Academia	881
H. Jaakkola, J. Henno, J. Mäkelä, K. Ahonen	

Use of ‘Learning Analytics’	888
J. Henno, H. Jaakkola, J. Mäkelä	
Smart Immersive Education for Smart Cities with Support via Intelligent Pedagogical Agents	894
M. Soliman, A. Elsaadany	
Review of Source-Code Plagiarism Detection in Academia	901
M. Novak	
The Comparison of Impact Offline and Online Presentation on Student Achievements: A Case Study	907
P. Esztelecki, G. Kőrösi, Z. Náместovski, L. Major	
Digital Competences for Teachers: Classroom Practice	912
M. Filipović Tretnjak, V. Anđelić	
Introducing Collaborative e-Learning Activities to the e-Course “Information Systems”	917
M. Ašenbrener Katić, S. Čandrlić, M. Holenko Dlab	
A Curriculum for Unified Embedded Engineering Education	923
I. Kaštelan, M. Temerinac	
Individual versus Collaborative Learning in a Virtual World	929
P. Pürcher, M. Höfler, J. Pirker, L. Tomes, A. Ischebeck, C. Gütl	
Preparation of a Hybrid e-Learning Course for Gamification	934
D. Kermek, D. Strmečki, M. Novak, M. Kaniški	
Implementation of Fundamental Ideas into the Future Managers’ Informatics Education	940
L. Révészová	
Fostering Creativity in Technology Enhanced Learning	946
A. Žižić, A. Granić, I. Šitin	
Teaching Physics in Primary Schools with Tablet Computers: Key Advantages	952
V. Grubelnik, L. Grubelnik	
Project Based Learning (PBL) in the Teachers’ Education	957
M. Krašna	
Didactical Suitability of e-Generated Drill Tests for Physics	962
R. Repnik, M. Sovič	
Utilizing MOOCs in the Development of Education and Training Programs	966
P. Linna, T. Mäkinen, H. Keto	

Distance Delivery and Technology-Enhanced Learning in Information Technology and Programming Courses at RIT Croatia	970
K. Marasović, B. Mihaljević, I. Bačić	
Overview of IT Solutions for Career Services and Quality Assurance at Higher Education	976
E. Gjorgjevska, P. Tonkovikj, M. Gusev	
Selecting the Most Appropriate Web IDE for Learning Programming Using AHP	982
I. Škorić, B. Pein, T. Orehovački	
Using Real Projects as Motivators in Programming Education	988
M. Konecki, S. Lovrenčić, M. Kaniški	
Making Programming Education More Accessible for Visually Impaired	992
M. Konecki, N. Ivković, M. Kaniški	
Use of Computer Programs in Teaching Photography Courses at Schools of Applied Arts and Design in Croatia	996
Z. Prohaska, Z. Prohaska, I. Uroda	
Universtiy Search Engine	1002
Ž. Knok, M. Marčec	
Experience with Usage of LMS Moodle not Only for the Educational Purposes at the Educational Institution	1006
D. Paľová	
Using Robot Simulation Applications at the University – Experiences with the KUKA Sim	1012
D. Lukac	
Implementation and Analysis of Open Source Information Systems in Electronic Business Course for Economy Students	1017
H. Jerković, P. Vranešić, G. Slamić	
Virtual Firms as Education Tool in the Field of eCommerce	1023
M. Vejačka	
Systems and Software Assurance - A Model Cyber Security Course	1028
V. Jovanović, J. Harris	
Analysis of Learning Management Systems Features and Future Development Challenges in Modern Cloud Environment	1033
H. Jerković, P. Vranešić, A. Radan	
Markov Model of Mathematical Competences in Elementary Education	1039
G. Paić, B. Tepeš, K. Pavlina	

PYTHON as Pseudo Language for Formal Language Theory	1045
Z. Dovedan Han, K. Kocijan, V. Lopina	
Croatian Students' Attitudes Towards Technology Usage in Teaching Asian Languages – a Field Research	1051
M. Janjić, S. Librenjak, K. Kocijan	
Adaptive e-Learning System for Language Learning: Architecture Overview	1056
V. Slavuj, B. Kovačić, I. Jugo	
L2L – Learn to Learn: Teach to Learn: CARTOON ENGLISH (A constructivist approach to teaching and learning)	1061
K. Bedi	
Facilitating Mobile Learning by Use of Open Access Information Resources	1067
R. Vrana	
Work-Based Learning: New Skills for New Technologies	1072
M. Lamza Maronić, I. Ivančić	
Creating Assets as a Part of Tertiary Education of Technical Domains	1078
J. Brozek, D. Hamernik, Z. Kopecky	
Software Solution Incorporating the Steganographic Principle for Hiding Pictures within Pictures	1084
J. Brozek, J. Marek, V. Svoboda	
A Platform Independent Tool for Programming, Visualization and Simulation of Simplified FPGAs	1091
M. Čupić, K. Brkić, Ž. Mihajlović	
Digital Risks and Experiences of Future Teachers	1097
T. Bratina	
A Study of Factors Influencing Higher Education Teachers' Intention to Use e-Learning in Hybrid Environments	1103
S. Babić, M. Čičin-Šain, G. Bubaš	
Development and Implementation of E-Learning System in Smart Educational Environment	1109
A. Elsaadany, K. Abbas	
Introducing Inquiry-Based Learning to Estonian Teachers: Experiences from the Creative Classroom Project	1115
N. Hoić-Božić, M. Laanpere, K. Pata, I. Franković, S. Teder	
Mobile Robots Approach for Teaching Programming Skills in Schools	1121
W. Werth, C. Ungermanns	

Age Independent Examination of Algorithm Creating Abilities	1125
Z.A. Godó, D. Kocsis, G. Kiss, G. Stóka	
The Digitalization Push in Universities	1130
H. Jaakkola, H. Aramo-Immonen, J. Henno, J. Mäkelä	
Toby the Explorer – an Interactive Educational Game for Primary School Pupils	1137
N. Kaevikj, A. Kostadinovska, B. Risteska Stojkoska, M. Mihova, K. Trivodaliev	
The Use of Contemporary e-Services and e-Contents at Mother Tongue Classes	1142
V. Jesenek	
Migration from in-House LMS to Google Classroom: Case of SEEU	1145
L. Abazi Bexheti, A. Kadriu, M. Apostolova Trpkovska	
Survey Analyses of Impacting Factors in ICT Usage in School Management: Case Study	1149
B. Fetaji, M. Fetaji, R. Azemi, M. Ebibi	
Case Study Analyses of Semantic Security Using SQL Injection in Web Enabled ORACLE Database	1155
M. Fetaji, B. Fetaji, M. Ebibi	
Using Web Applications in Education	1161
A. Babić, S. Vukmirović, Z. Čapko	
Qualitative Approach to Determining the Relevant Facets of Mobile Quality of Educational Social Web Applications	1165
T. Orehovački, S. Babić	
Međukurikularni projekti u nastavi informatike u Ekonomskoj školi – primjeri dobre prakse	1171
S. Bulešić Milić	
Tradicionalni ili hibridni model nastave računalstva	1174
M. Sertić, K. Šolić	
Provjere znanja pomoću Classroom Managera u učionicama budućnosti	1180
M. Korać	
Primjena e-učenja u hrvatskom vojnom obrazovanju	1184
D. Možnik	
Prezentacijski alati za prikaz matematičkih sadržaja	1190
M. Štefan Trubić, I. Radošević	

Siguran put do škole	1196
D. Šokac, I. Biuklija	
Primjena obrazovne društvene mreže Edmodo u nastavi III. osnovne škole Čakovec	1199
N. Boj	
Digitalni scenariji učenja	1203
M. Mirković	
Detekcija najčešćih sintaktičkih i logičkih grešaka učenika kod stvaranja programa u početnim godinama učenja programiranja	1209
K. Blažeka	
Nastava matematike na SageMathCloud platformi	1215
Ž. Tutek	
Uvod u robotiku - Arduino platforma i web aplikacija	1218
A. Lacković, B. Fulanović	
Informacijski sustav visokih učilišta - analiza slučaja za Veleučilište u Šibeniku	1222
S. Krajačić, L. Topolčić, F. Urem	
Mobilne aplikacije u visokom obrazovanju	1225
M. Blašković, M. Fumić, F. Urem	
Metodologija izrade <i>E – learning</i> sadržaja za edukaciju o izradi Standarda zanimanja	1230
I. Vunarić, S. Grgić, T. Babić	
Uloga IKT u razvoju financijske pismenosti djece	1235
I. Ružić	
Informacijsko-komunikacijske znanosti u nastavi - digitalizirani materijali za učenje	1239
T. Babić, A. Ogrin, M. Babić	
Istraživanje stavova i očekivanja studenata prilikom upisa na studij kao metoda povećanja kvalitete usluge u visokom obrazovanju	1245
T. Babić, S. Grgić, E. Rajković	
E-obrazovanjem do fleksibilnog modela učenja	1250
M. Božurić, R. Bogut, M. Tretinjak	
Preporuke i primjeri dobre prakse e-učenja u hrvatskom visokom školstvu	1254
D. Junaković, I. Pačelat, F. Urem	

Ilustracija primjene novog Kurikuluma iz predmeta Informatika i to domene - Računalno razmišljanje i programiranje na primjeru metode Početnica Mema za prvi razred osnovne škole	1258
M. Čičin-Šain, S. Babić, L. Kralj	

Izloženost i navike korištenja medija i računala kod djece u razrednoj nastavi	1262
T. Pavičić, J. Šurić	

COMPUTERS IN TECHNICAL SYSTEMS

INVITED PAPERS

Architecture and Application of Virtual Desk and 3D Process Simulation for Wire Rod Rolling Mills	1271
A. Venuti	

Use of Offline Computational Tools for Plant Data Analysis and Setup Model Calibration: a Perspective in the Industry of Flat Metal Production	1276
C. Aurora, F.A. Cuzzola	

Architecture and Implementation of a MES System in a Large Scale Steel Plant: Severstal Cherepovets Success Story	1280
G. Brunetti	

PAPERS

Anfis as a Method for Determinating MPPT in the Photovoltaic System Simulated in Matlab/Simulink	1289
D. Mlakić, S. Nikolovski	

Linear Motion Calculation of the High Voltage Circuit Breaker Contacts Using Rotary Motion Measurement with Nonlinear Transfer Function	1294
K. Obarčanin, R. Ostojić	

Robot Arm Teleoperation via RGBD Sensor Palm Tracking	1300
F. Marić, I. Jurin, I. Marković, Z. Kalafatić, I. Petrović	

A Proposal for a Fully Distributed Flight Control System Design	1306
M. Šegvić, K. Krajček Nikolić, E. Ivanjko	

Control of Thermal Process with Simulink and NI USB-6211 in Real Time	1311
I. Tikvić, G. Vujisić, M. Fruk	

Stabilization of Multi-AUV Formation with Digital Control	1315
S.A. Ul'yanov, N.N. Maksimkin	

A Hybrid Approach to Solve the Dynamic Patrol Routing Problem for Group of Underwater Robots	1321
M.Yu. Kenzin, I.V. Bychkov, N.N. Maksimkin	
Multi - Heater Induction Heating System with Sandwich Material Heater	1327
A. Smrke	
Two-Rate Motion Control of VTAV by NARMA-L2 Controller for Enhanced Situational Awareness	1333
I. Astrov	
LADDER Program Solution for Multi-probe Monitoring and Control in Simple Cooling Process	1339
T. Špoljarić, M. Špoljarić	
An M2M Solution for Smart Metering in Electrical Power Systems	1348
M.P. Shopov	
Noise within a Data Center	1352
D. Miljković	
Active Noise Control: From Analog to Digital – Last 80 Years	1358
D. Miljković	
Responding to Stakeholders’ Resistance to Change in Software Projects – A Literature Review	1364
S.L.R. Vrhovec	
Object-Oriented Programming Model for Synthesis of Domain-Specific Application Development Environment	1369
T. Lugarić, Z. Pavlić, D. Škvorc	
Logistic and Production Computer Systems in Small-Medium Enterprises	1375
M. Pighin	
The Implications of Employing Component Based Software Design in Non-Commercial Applications	1380
B. Zorić, G. Martinović, I. Crnković	
Extended Approach to Selecting a Project-specific Reliability Growth Model	1386
J. Krini, A. Krini, O. Krini, J. Böresök	
Embedded Linux Controlled Sensor Network	1392
M. Saari, A.M. Baharudin, P. Sillberg, P. Rantanen, J. Soini	

Portable Sensor System for Reliable Condition Measurement	1397
J. Soini, P. Sillberg, P. Rantanen, J. Nummela	
Architecture of an Interoperable IoT Platform Based on Microservices	1403
T. Vresk, I. Čavrak	
Performance Estimation in Heterogeneous MPSoC Based on Elementary Operation Cost	1409
N. Frid, D. Ivošević, V. Sruk	
Sustav za lociranje atmosferskih pražnjenja u identifikaciji kvarova TK mreže uzrokovanih atmosferskim prenaponima	1413
V. Milardić, B. Franc, M. Budimirović	
SNUPI - Sustav za nadzor i upravljanje procesima infrastrukture podatkovnog centra	1420
M. Zmijanac	

INTELLIGENT SYSTEMS

BiForD • SPECIAL SESSION ON BIOMETRICS & FORENSICS & DE-IDENTIFICATION AND PRIVACY PROTECTION

KEYNOTE SPEECH

Face Alignment: Addressing Pose Variability in Face Recognition Systems	1433
V. Štruc	

PAPERS

Shape and Texture Combined Face Recognition for Detection of Forged ID Documents	1437
D. Sáez-Trigueros, H. Hertlein, L. Meng, M. Hartnett	
Simple Method Based on Complexity for Authorship Detection of Text	1443
L. Meluch, I. Tokárová, P. Farkaš, F. Schindler	
Privacy Protection Performance of De-identified Face Images with and without Background	1448
Z. Sun, L. Meng, A. Ariyaeinia, X. Duan, Z.-H. Tan	
Deep Metric Learning for Person Re-Identification and De-Identification	1454
I. Filković, Z. Kalafatić, T. Hrkać	

Deformable Part-Based Robust Face Detection under Occlusion by Using Face Decomposition into Face Components	1459
D. Marčetić, S. Ribarić	

Creating a Face Database for Age Estimation and Classification	1465
P. Grd, M. Bača	

Forensic Anthropometry from Voice: An Articulatory-Phonetic Approach	1469
R. Singh, B. Raj, D. Gencaga	

INTELLIGENT SYSTEMS

PAPERS

Computer Vision for the Blind: a Dataset for Experiments on Face Detection and Recognition	1479
S. Carrato, S. Marsi, E. Medvet, F.A. Pellegrino, G. Ramponi, M. Vittori	

Impact of Light Conditions on the Vertical Traffic Signs Detection in Vertical Traffic Signs Recognition System	1485
D. Solus, L. Ovseník, J. Turán	

Wound Detection and Reconstruction Using RGB-D Camera	1490
D. Filko, E.K. Nyarko, R. Cupec	

Clustering of Affective Dimensions in Pictures: An Exploratory Analysis of the NAPS Database	1496
M. Horvat, K. Jednoróg, A. Marchewka	

Challenges in Adopting Big Data Strategies and Plans in Organizations	1502
A. Budin, S. Krajnović	

A Survey of Intelligent System Techniques for Indian Stock Market Forecasting	1508
S. Panwar, V.P. Upadhyay, S.K. Bishnoi	

The Effect of Class Distribution on Classification Algorithms in Credit Risk Assessment	1514
K. Andrić, D. Kalpić	

Software Solution for Optimal Planning of Sales Persons Work Based on Depth-First Search and Breadth-First Search Algorithms	1521
E. Žunić, A. Djedović, B. Žunić	

Iterated Local Search Algorithm for Planning the Sequence of Arrivals and Departures at Airport Runways	1527
E. Bytyçi, K. Sylejmani, A. Dika	

Energy Efficiency with Intelligent Light Management Systems	1532
I. Britvić, A. Nikitović	
Adaptive and Modular Urban Smart Infrastructure	1538
M. Klarić, I. Kuzle, I. Livaja	
Automatic Pathole and Speed Breaker Detection Using Android System	1543
V. Rishiwal, H. Khan	
The Influence of the CAPTCHA Types to Its Solving Times	1547
D. Brodić, S. Petrovska, M. Jevtić, Z.N. Milivojević	
Techniques and Applications of Emotion Recognition in Speech	1551
S. Lugović, I. Dunder, M. Horvat	
Word Occurrences and Emotions in Social Media: Case Study on a Twitter Corpus	1557
I. Dunder, M. Horvat, S. Lugović	
The Application of Parameterized Algorithms for Solving SAT to the Study of Several Discrete Models of Collective Behavior	1561
S. Kochemazov, A. Semenov, O. Zaikin	
Logical-Algebraic Equations Application in Discrete-Event Systems Studying	1566
N. Nagul	
An Evaluation Framework and a Brief Survey of Decision Tree Tools	1572
N. Vlahović	
Positive Constructed Formulas Preprocessing for Automatic Deduction	1578
E. Cherkashin, A. Davydov, A. Larionov	
Monte-Carlo Randomized Algorithm: Empirical Analysis on Real-World Information Systems	1582
R. Kudelić, D. Oreški, M. Konecki	
Control Flow Graph Visualization in Compiled Software Engineering	1586
A. Mikhailov, A. Hmelnov, E. Cherkashin, I.V. Bychkov	
Bottom-Left and Sequence Pair for Solving Packing Problems	1591
T. Rolich, D. Domović, M. Golub	
Automatic Image Annotation Refinement	1597
M. Pobar, M. Ivašić-Kos	

Defining Ontology Combining Concepts of Massive Multi-Player Online Role Playing Games and Organization of Large-Scale Multi-Agent Systems	1603
B. Okreša Đurić, M. Schatten	

Comparison of Solution Representations for Scheduling in the Unrelated Machines Environment	1609
M. Đurasević, D. Jakobović	

INFORMATION SYSTEMS SECURITY

PAPERS

TECHNICAL TRACK

Technical Recommendations for Improving Security of Email Communications	1623
A. Malatras, I. Coisel, I. Sanchez	

Performance Analysis of Two Open Source Intrusion Detection Systems	1629
B. Brumen, J. Legvart	

Challenges of Mobile Device Use in Healthcare	1635
S.L.R. Vrhovec	

Safe Use of Mobile Devices in the Cyberspace	1639
S.L.R. Vrhovec	

Securing Web Content and Services in Open Source Content Management Systems	1644
H. Jerković, P. Vranešić, S. Dadić	

Can Malware Analysts be Assisted in Their Work Using Techniques from Machine Learning?	1650
I. Novković, S. Groš	

Performance Evaluation of a Rule-Based Access Control Framework	1656
S.A. Afonin	

SOCIAL ENGINEERING TRACK

Going White Hat: Security Check by Hacking Employees Using Social Engineering Techniques	1663
Z. Lovrić Švehla, I. Sedinić, L. Pauk	

Analysis of Phishing Attacks against Students	1667
J. Andrić, D. Oreški, T. Kišasondi	
What Do Students Do with Their Assigned Default Passwords?	1674
L. Bošnjak, B. Brumen	
Analysing Real Students' Passwords and Students' Passwords Characteristics Received From a Questionnaire	1680
V. Taneski, M. Heričko, B. Brumen	

MISC TRACK

Using DEMF in Process of Collecting Volatile Digital Evidence	1689
M. Bača, J. Čosić, P. Grd	
From Safe Harbour to European Data Protection Reform	1694
T. Katulić, G. Vojković	
Information Security Assessment in Nature Parks	1699
S. Aksentijević, T. Đugum, K. Šakić	
Clustering Approach for User Location Data Privacy in Telecommunication Services	1706
M. Vuković, M. Kordić, D. Jevtić	
Analiza sigurnosnih ranjivosti inteligentnih sučelja za upravljanje podatkovnim centrom	1711
M. Ramljak	

BUSINESS INTELLIGENCE SYSTEMS

PAPERS

Analyzing Air Pollution on the Urban Environment	1723
E. Baralis, T. Cerquitelli, S. Chiusano, P. Garza, M.R. Kavosifar	
Application of Model Driven Architecture for Development of Data Consolidation Web-System	1729
A.A. Korobko, L.F. Nozhenkova	
Business Process Management Systems Selection Guidelinelines: Theory and Practice	1735
V. Bosilj Vukšić, L. Brkić, M. Baranović	
Organization of Tax Data Warehouse for Legal Entities	1741
M. Sretenović, B. Kovačić, V. Jovanović	

Predictive Analytics in Big Data Platforms – Comparison and Strategies	1747
M. Zekić-Sušac, A. Has	

The Analysis of CSFs in Stages of ERP Implementation - Case Study in Small and Medium - Sized (SME) Companies in Croatia	1753
M. Nikitović, V. Strahonja	

Model optimizacije procesa s primjenom na punjenju bankomata	1759
I. Osman, K. Bokulić	

DIGITAL ECONOMY AND GOVERNMENT, LOCAL GOVERNMENT, PUBLIC SERVICES

PAPERS

The Modern Approach to the Analysis of Logistics Information Systems	1769
A. Iskra, E. Tijan, S. Aksentijević	

Development of the Data Warehouse Model for Public Authorities Accounts in Croatia	1774
M. Sretenović, B. Kovačić, V. Jovanović	

The Future of Digital Economy in Some SEE Countries (Case study: Croatia, Macedonia, Montenegro, Serbia, Bosnia and Herzegovina)	1780
M. Vidas-Bubanja, I. Bubanja	

Effects and Evaluation of Open Government Data Initiative in Croatia	1786
T. Vračić, M. Varga, K. Ćurko	

ICT Technologies and Structured Dialogue: Experience of "Go, go, NGO!" Project	1792
N. Kadoić	

Using ICT Tools for Decision Making Support in Local Government Units	1798
N. Kadoić, I. Kedmenec	

The Conceptual Risk Management Model - A Case Study of Varazdin County	1804
R. Kelemen, M. Biškup, N. Begičević Ređep	

Electronic Commerce in Croatia and a Comparison of Open Source Tools for the Development of Electronic Commerce	1811
J. Tomljanović, T. Turina, E. Krelja Kurelović	

The Social Marketing as Prerequisite for the Competitiveness of South-East European Companies	1817
I. Bubanja	
Homeostasis and Collaborative Decision Making for Smart and Cognitive Cities	1822
J. Klasinc	
Can the Bank Payment Obligation Replace the International Documentary Letter of Credit?	1828
R. Bergami	
Implementation and Design of Cool'n'Project - Web-Based Project Management Software	1834
I. Špeh	
Analysis of ICT Use in Private Accommodation Rentals in Croatia.....	1841
Lj. Zekanović-Korona, J. Grzunov	
Records Management Challenges and Opportunities: An Australian Perspective	1847
A. Davies, R. Bergami	
Effectiveness Analysis of Using Solid State Disk Technology	1852
A. Skendžić, B. Kovačić, E. Tijan	
Information and Communication Technologies and the New Forms of Organized Crime in Network Society	1857
M. Boban	
Digitalizacija lokalne uprave na primjeru Istarske županije	1863
L. Ordanić, N. Šarić-Kekić	
Digitalna ekonomija – rezultanta disruptivnih tehnologija	1869
M. Mauher	

MIPRO Junior – STUDENT PAPERS

PAPERS

Technical Diagnosis of Basic Logic Gates	1879
Z. Tucaković	
Developing a Parking Monitoring System Based on the Analysis of Images from an Outdoor Surveillance Camera	1884
I.V. Sukhinskiy, E.A. Nepovinnykh, G.I. Radchenko	

Laboratory Model of an Elevator: Control with Three Speed Profiles	1889
A. Jozić, T. Špoljarić, D. Gadže	
Security and Privacy in an IT Context – a Low-Cost WIDS Employed against MITM Attacks (concept)	1895
N. Poljak, M. Ševo, I. Livaja	
Use of HLA During Customer Flow Simulation in a Polyclinic	1899
J. Brozek, J. Fikejz, V. Samotan, L. Gago	
Revealing the Structure of Domain Specific Tweets via Complex Networks Analysis	1904
E. Močibob, S. Martinčić-Ipšić, A. Meštrović	
Counting Prime Numbers in Paralell - Faster by Reducing the Synchronization Overhead	1909
A. Duraković, E. Pajić, I. Branković, E. Kušundžija, S. Karkelja	
Parallelization Challenges of BFS Traversal on Dense Graphs Using the CUDA Platform	1914
H. Milišić, D. Ahmić, H. Sinanović, E. Šarić, A. Asotić, A. Huseinović	
Buck Converter Controlled by Arduino Uno	1919
H. Kovačević, Ž. Stojanović	
Audio Phonebook for the Blind People	1924
G. Popović, U. Pale	
Heart Rate Variability Analysis Using Different Wavelet Transformations	1930
U. Pale, F. Thürk, E. Kaniusas	
Istraživanje <i>ransomware</i> napada i prijedlozi za bolju zaštitu	1936
M. Rak, M. Žagar	

LIST OF PAPER REVIEWERS

Aksentijević, S.	(Croatia)	Džanko, M.	(Croatia)
Alexin, Z.	(Hungary)	Džapo, H.	(Croatia)
Antolić, Ž.	(Croatia)	Đerek, V.	(Croatia)
Antonić, A.	(Croatia)	Erceg, I.	(Croatia)
Aramo-Immonen, H.	(Finland)	Eškinja, Z.	(Croatia)
Arbula, D.	(Croatia)	Fertalj, K.	(Croatia)
Ašenbrener Katić, M.	(Croatia)	Filjar, R.	(Croatia)
Avbelj, V.	(Slovenia)	Fischer, D.	(Croatia)
Babić, D.	(Croatia)	Frid, N.	(Croatia)
Babić, S.	(Croatia)	Galinac Grbac, T.	(Croatia)
Bačmaga, J.	(Croatia)	Gamulin, O.	(Croatia)
Bako, N.	(Croatia)	Garza, P.	(Italy)
Balaž, A.	(Serbia)	Glavaš, G.	(Croatia)
Banek, M.	(Croatia)	Glavaš, J.	(Croatia)
Banek Zorica, M.	(Croatia)	Gojanović, D.	(Croatia)
Barić, A.	(Croatia)	Golfarelli, M.	(Italy)
Basch, D.	(Croatia)	Golub, M.	(Croatia)
Bebel, B.	(Croatia)	Golubić, S.	(Croatia)
Begušić, D.	(Croatia)	Gomez Chavez, A.	(Germany)
Bellatreche, L.	(France)	Gracin, D.	(Croatia)
Bibuli, M.	(Italy)	Granić, A.	(Croatia)
Bilas, V.	(Croatia)	Grd, P.	(Croatia)
Blažević, D.	(Croatia)	Grgić, K.	(Croatia)
Blažević, Z.	(Croatia)	Grgurić, A.	(Sweden)
Blečić, R.	(Croatia)	Groš, S.	(Croatia)
Bogunović, N.	(Croatia)	Grubišić, D.	(United States)
Bonastre, J.	(France)	Gržinić, T.	(Croatia)
Bosiljevac, M.	(Croatia)	Gulić, M.	(Croatia)
Brčić, M.	(Croatia)	Hadjina, T.	(Croatia)
Bregar, K.	(Slovenia)	Henno, J.	(Estonia)
Brestovec, B.	(Croatia)	Hoić-Božić, N.	(Croatia)
Brezany, P.	(Austria)	Holenko Dlab, M.	(Croatia)
Britvić, I.	(Croatia)	Horvat, G.	(Croatia)
Brkić, K.	(Croatia)	Horvat, M.	(Croatia)
Brkić, L.	(Croatia)	Hrabar, S.	(Croatia)
Brkić, M.	(Croatia)	Hrkać, T.	(Croatia)
Broz, I.	(Croatia)	Humski, L.	(Croatia)
Budin, A.	(Croatia)	Hure, N.	(Croatia)
Budin, L.	(Croatia)	Ilić, Ž.	(Croatia)
Bujan, I.	(Croatia)	Inkret, R.	(Croatia)
Bujas, G.	(Croatia)	Ipšić, I.	(Croatia)
Buković, M.	(Croatia)	Ivanjko, E.	(Croatia)
Butković, Ž.	(Croatia)	Ivašić-Kos, M.	(Croatia)
Car, Ž.	(Croatia)	Ivković, N.	(Croatia)
Cifrek, M.	(Croatia)	Ivošević, D.	(Croatia)
Crnković Stumpf, B.	(Croatia)	Jaakkola, H.	(Finland)
Čačković, V.	(Croatia)	Jakobović, D.	(Croatia)
Čandrlić, S.	(Croatia)	Jakopović, Ž.	(Croatia)
Čeperić, V.	(Croatia)	Jakupović, A.	(Croatia)
Čičin-Šain, M.	(Croatia)	Jardas, M.	(Croatia)
Čubriilo, M.	(Croatia)	Jarm, T.	(Slovenia)
Čupić, M.	(Croatia)	Jelenković, L.	(Croatia)
Davidović, M.	(Croatia)	Jevtić, D.	(Croatia)
Delač, G.	(Croatia)	Ježić, G.	(Croatia)
Depolli, M.	(Slovenia)	Joler, M.	(Croatia)
Dešić, S.	(Croatia)	Jovanovic, V.	(United States)
Dobrijević, O.	(Croatia)	Jović, A.	(Croatia)
Domazet-Lošo, M.	(Croatia)	Kalafatić, Z.	(Croatia)
Duarte, M.	(Portugal)	Kalpić, D.	(Croatia)

Kapus-Kolar, M.	(Slovenia)	Mrković, B.	(Croatia)
Karan, M.	(Croatia)	Nađ, Đ.	(Croatia)
Kaštelan, I.	(Serbia)	Nikitović, M.	(Croatia)
Katanić, N.	(Croatia)	Očko, M.	(Croatia)
Kaučić, B.	(Slovenia)	Oletić, D.	(Croatia)
Keto, H.	(Croatia)	Orsag, M.	(Croatia)
Kišasondi, T.	(Croatia)	Pale, P.	(Croatia)
Klemenc-Ketiš, Z.	(Croatia)	Palestri, P.	(Italy)
Kocev, D.	(Slovenia)	Paspallis, N.	(United Kingdom)
Kocijan, K.	(United States)	Pavlič, Z.	(Croatia)
Kopčak, G.	(Sweden)	Pečar-Ilić, J.	(Croatia)
Koričić, M.	(Croatia)	Pelin, D.	(Croatia)
Kosec, G.	(Slovenia)	Perić Hadžić, A.	(Croatia)
Kovačić, A.	(Croatia)	Perkovac, M.	(Croatia)
Kovačić, B.	(Croatia)	Perković, T.	(Croatia)
Krašna, M.	(Slovenia)	Petrović, G.	(Croatia)
Krhen, M.	(Croatia)	Pintar, D.	(Croatia)
Krivec, S.	(Croatia)	Pivac, B.	(Croatia)
Krois, I.	(Croatia)	Pobar, M.	(Croatia)
Krpić, Z.	(Croatia)	Pocta, P.	(Slovakia)
Kudelić, R.	(Croatia)	Poljak, M.	(Croatia)
Kunda, I.	(Croatia)	Poplas Susić, T.	(Slovenia)
Kušek, M.	(Croatia)	Pribanić, T.	(Croatia)
Lacković, I.	(Croatia)	Pripužić, K.	(Croatia)
Lipovac, A.	(Croatia)	Ptiček, M.	(Croatia)
Lo Presti, F.	(Italy)	Rashkovska, A.	(Slovenia)
Lončarić, S.	(Croatia)	Repnik, R.	(Slovenia)
Lovrenčić, A.	(Croatia)	Resnik, D.	(Slovenia)
Lučev Vasić, Ž.	(Croatia)	Ribarić, S.	(Croatia)
Lučić, D.	(Croatia)	Rimac-Drlje, S.	(Croatia)
Lugarić, T.	(Croatia)	Ristić, D.	(Croatia)
Lukac, D.	(Germany)	Rupčić, S.	(Croatia)
Ljubić, S.	(Croatia)	Seva, J.	(United Kingdom)
Maček, M.	(Slovenia)	Sillberg, P.	(Finland)
Magdalenić, I.	(Croatia)	Skala, K.	(Croatia)
Malarić, R.	(Croatia)	Skočir, P.	(Slovenia)
Mandić, F.	(Croatia)	Skorin-Kapov, L.	(Croatia)
Mandić, T.	(Croatia)	Soini, J.	(Finland)
Maračić, M.	(Croatia)	Soler, J.	(Denmark)
Marčetić, D.	(Croatia)	Sorić, K.	(Croatia)
Marinović, I.	(Croatia)	Sruk, V.	(Croatia)
Marinović, M.	(Croatia)	Stanić, J.	(Slovenia)
Marjanović, M.	(Croatia)	Stanić, U.	(Slovenia)
Markuš, N.	(Croatia)	Stapić, Z.	(Croatia)
Martinčić-Ipšić, S.	(Croatia)	Stojković, N.	(Croatia)
Matić, T.	(Croatia)	Stupar, I.	(Croatia)
Mauša, G.	(Croatia)	Sučić, S.	(United States)
Mekovec, R.	(Croatia)	Suligoj, T.	(Croatia)
Mekterović, I.	(Croatia)	Sužnjević, M.	(Croatia)
Meng, L.	(United Kingdom)	Sviličić, B.	(Croatia)
Mezak, J.	(Croatia)	Šarolić, A.	(Croatia)
Mihajlović, Ž.	(Croatia)	Šegvić, S.	(Croatia)
Mikac, B.	(Croatia)	Ševrović, M.	(Croatia)
Mikuc, M.	(Croatia)	Šikić, M.	(Croatia)
Milanović, I.	(Serbia)	Šilić, M.	(Croatia)
Miličević, K.	(Croatia)	Škvorc, D.	(Croatia)
Mišković, N.	(Croatia)	Štajduhar, I.	(Croatia)
Mlinarić, H.	(Croatia)	Štih, Ž.	(Croatia)
Močinić, D.	(Croatia)	Šunde, V.	(Croatia)
Modlic, B.	(Croatia)	Švedek, T.	(Croatia)
Molnar, G.	(Croatia)	Švogor, I.	(Croatia)
Mošmondor, M.	(Croatia)	Tanković, N.	(Croatia)
Mrakovčić, T.	(Croatia)	Tijan, E.	(Croatia)

Tomczak, J.	(Austria)	Vrdoljak, B.	(Croatia)
Tomić, M.	(Croatia)	Vrhovec, S.	(Slovenia)
Tralić, D.	(Croatia)	Vrlika, V.	(Croatia)
Trancoso, I.	(Portugal)	Vukadinović, D.	(Croatia)
Trobec, R.	(Slovenia)	Vuković, M.	(Croatia)
Tržec, K.	(Croatia)	Weber, M.	(Croatia)
Tuomi, P.	(Finland)	Werth, W.	(Austria)
Uroda, I.	(Croatia)	Zaluški, D.	(Croatia)
Varga, M.	(Croatia)	Zereik, E.	(Italy)
Vasić, D.	(Croatia)	Zinner, T.	(Germany)
Vidaček-Hainš, V.	(Croatia)	Žonja, S.	(Croatia)
Vladimir, K.	(Croatia)	Zulim, I.	(Croatia)
Vlahović, N.	(Croatia)	Žgank, A.	(Slovenia)
Vojković, G.	(Croatia)	Žilak, J.	(Croatia)
Vrančić, K.	(Croatia)	Živković, M.	(Croatia)
Vranić, M.	(Croatia)	Žulj, S.	(Croatia)

AUTHOR INDEX

Aalto, S.	515	Barić, A.	63, 78, 105, 110
Abazi Bexheti, L.	1145	Batbayar, K.	269
Abbas, K.	1109	Bedi, K.	1061
Abe, H.	257	Begičević Redep, N.	1804
Accardo, A.	719	Belalem, G.	214
Adamovic, N.	158	Belošić, D.	679
Afgan, E.	298	Benedetti, A.	5
Afonin, S.A.	1656	Benedyczak, K.	190
Ahmić, D.	1914	Berdalović, I.	40
Ahonen, K.	881	Berdinsky, A.S.	11, 16
Ajčević, M.	719	Bergami, R.	1828, 1847
Aksentijević, S.	1699, 1769	Berković, M.	703
Alagić, D.	224, 230	Bianchi, F.	509
Alekseev, Yu.V.	20	Bishnoi, S.K.	1508
Alić, D.	745	Biškup, M.	1804
Ambroš, F.	826	Biuklija, I.	1196
Amin, N.	656	Blašković, M.	1225
Andrić, J.	1667	Blažeka, K.	1209
Andrić, K.	1514	Blečić, R.	105
Anđelić, N.	841	Boban, M.	713, 1857
Anđelić, V.	912	Bogut, R.	1250
Antonijević, M.	332	Boj, N.	1199
Apostolova Trpkovska, M.	1145	Bokulić, K.	1759
Aramo-Immonen, H.	1130	Börcsök, J.	1386
Arbanas, K.	224	Bosić, Z.	640
Arbet, D.	57	Bosilj Vukšić, V.	1735
Arbula, D.	253	Bošković, D.	521, 628
Ariyaeinia, A.	1448	Bošnjak, L.	1674
Arsenovski, S.	388	Bothe, K.	766
Artemkina, S.B.	16	Božurić, M.	1250
Asiama Nyako, W.	707	Brandonisio, F.	90
Asotić, A.	1914	Branković, I.	1909
Assefa, T.D.	673	Bratina, T.	1097
Astrov, I.	1333	Brenner, W.	158
Ašenbrener Katić, M.	917	Brezany, P.	202
Aurora, C.	1276	Britvić, I.	1532
Avbelj, V.	416	Brkić, K.	1091
Azemi, R.	1149	Brkić, L.	1735
Babić, M.	367	Brložnik, M.	416
Babić, A.	1161	Brodić, D.	1547
Babić, M.	1239	Brozek, J.	337, 1078, 1084, 1899
Babić, S.	1103	Brumen, B.	1629, 1674, 1680
Babić, S.	1165, 1258	Brunetti, G.	1280
Babić, T.	1230, 1239, 1245	Bubanja, I.	1780, 1817
Bača, M.	1465, 1689	Bubaš, G.	1103
Bačić, I.	970	Budimac, Z.	766
Bačmaga, J.	78	Budimirović, M.	1413
Badnjević, A.	395, 407, 477	Budin, A.	1502
Baggini, M.	836	Budiša, D.	690
Baharudin, A.M.	1392	Bulešić Milić, S.	1171
Bakalar, G.	836	Bulović, A.	472
Balić, K.	376	Bychkov, I.V.	1321, 1586
Balki, M.	558	Bytyçi, E.	1527
Balota, A.	370	Bziuk, W.	684
Bánáti, A.	343	Cakaj, S.	554
Bandiziol, A.	90	Capeska Bogatinoska, D.	707
Banović-Ćurguz, N.	794, 800	Carlini, G.	719
Baralis, E.	1723	Carrato, S.	1479
Baranović, M.	1735	Celesti, A.	426

Cerquitelli, T.	1723	Fazio, M.	426
Cherkashin, E.	1578, 1586	Fedorov, V.E.	11, 16
Chiusano, S.	1723	Feilhauer, T.	202
Chiussi, S.	5	Feoktistov, A.G.	247
Chungurski, S.	388	Fetaji, B.	1149, 1155
Cifrek, M.	289, 326, 395, 407, 411, 446	Fetaji, M.	1149, 1155
Cmuk, D.	852	Fikejz, J.	1899
Coisel, I.	1623	Filipović Tretinjak, M.	912
Cota, P.	622	Filko, D.	1490
Craninckx, J.	72	Filković, I.	1454
Crnković, I.	1380	Finny, S.	126
Cupec, R.	1490	Fischer, I.A.	5
Cuzzola, F.A.	1276	Fosić, I.	690
Čačković, V.	584	Franc, B.	1413
Čandrlić, S.	917	Franković, I.	1115
Čapko, Z.	1161	Fratte-Sumper, S.	110
Čavrak, I.	1403	Frid, N.	1409
Čičin-Šain, M.	1103, 1258	Friganović, K.	411
Čižmar, R.	640	Fruk, M.	1311
Čošić, V.	814	Fulanović, B.	1218
Čović, M.	30	Fumić, M.	1225
Čubrić, G.	869	Gabela, A.	777
Čupić, M.	1091	Gadže, D.	1889
Ćosić, J.	1689	Gago, L.	1899
Ćurko, K.	1786	Galin, M.	640
D'Antrassi, P.	719	Galinac Grbac, T.	634
Dadić, M.	146, 543	Gao, Y.	289, 432, 446
Dadić, S.	1644	Garaguly, Z.	269
Daković, M.	569	Garza, P.	1723
Dancheva, T.	208	Gebrehiwot, M.E.	515
Date, S.	257	Gencaga, D.	1469
Davies, A.	1847	Geraskin, A.S.	95
Davitashvili, T.	236	Giedrimas, V.	745
Davydov, A.	1578	Girtelschmid, S.	263
Depolli, M.	401, 487	Gjorgjevska, E.	976
Dević, I.	640	Glamočanin, D.	755
Diduck, Q.	105	Godó, Z.A.	1125
Dika, A.	1527	Golub, I.	761
Dika, F.	185	Golub, M.	1591
Dizdarević, H.	599, 606	Goonasekera, N.	298
Dizdarević, S.	599, 606	Gorachinova, L.	388
Djebbar, E.I.	214	Gorshkova, A.S.	20
Djedović, A.	1521	Gradišnik, V.	30
Djinevski, L.	388	Granić, A.	946
Domanjko-Petrič, A.	416	Grd, P.	1465, 1689
Domović, D.	1591	Grgić, S.	1230, 1245
Dovedan Han, Z.	1045	Grgurević, I.	736
Dražić Lutitsky, I.	809	Grilec, F.	446
Du, M.	289, 432, 446	Grollitsch, W.	90
Duan, X.	1448	Groš, S.	1650
Dudarin, A.	100	Grozev, D.G.	314
Dunder, I.	1551, 1557	Grubelnik, L.	952
Duraković, A.	1909	Grubelnik, V.	952
Đambić, G.	442	Grubišić, D.	40
Đigaš, T.	826	Grzunov, J.	1841
Đugum, T.	1699	Gulan, G.	380
Đurasević, M.	1609	Gurbeta, L.	395, 407, 477
Ebibi, M.	1149, 1155	Gusev, M.	208, 218, 420, 976
Elsaadany, A.	894, 1109	Guseva, A.	218
Enne, R.	68	Gütl, C.	929
Erceg, I.	152	Hadžiahmetović, N.	599, 606
Esztelecki, P.	907	Hajdo, H.	831
Farkaš, P.	1443	Hajnić, M.	852

Hamernik, D.	1078	Kadoić, N.	1792, 1798
Hamidović, D.	650	Kadriu, A.	1145
Han, M.K.	11	Kaevikj, N.	1137
Harris, J.	1028	Kail, E.	348
Hartnett, M.	1437	Kakanakov, N.R.	314
Has, A.	1747	Kalafatić, Z.	1300, 1454
Heđi, I.	805	Kalpić, D.	1514
Henno, J.	881, 888, 1130	Kamcheva, E.	388
Herceg, M.	86	Kaniški, M.	934, 988, 992
Heričko, M.	1680	Kaniusas, E.	1930
Hertlein, H.	1437	Karkelja, S.	1909
Hmelnov, A.	1586	Kaštelan, I.	923
Höfler, M.	929	Kathiravelu, P.	634
Hoić-Božić, N.	1115	Katulić, T.	1694
Holenko Dlab, M.	917	Kavoosifar, M.R.	1723
Hormot, F.	78	Kawai, E.	257
Horvat, G.	135	Kedmenec, I.	1798
Horvat, M.	1496, 1551, 1557	Kelemen, R.	1804
Hrkać, T.	1454	Kenzin, M.Yu.	1321
Huseinović, A.	1914	Kermek, D.	934
I. Orović,	574	Kertesz, A.	497
Ichikawa, K.	257	Keserica, H.	332
Iković, O.	521, 628	Keto, H.	966
Iliev, L.A.	550, 562	Khan, H.	1543
Iliev, O.	388	Kido, Y.	257
Iliev, T.B.	550, 562	Kim, S.J.	11
Ilišević, D.	794, 800	Kiss, G.	1125
Ischebeck, A.	929	Kišasondi, T.	1667
Iskra, A.	1769	Klarić, M.	1538
Ivančić, I.	1072	Klasinc, J.	1822
Ivanova, E.P.	550, 562	Klobučarević, D.	679
Ivanović, M.	531, 766	Klobučarević, Ž.	679
Ivanjko, E.	1306	Kljaić, Z.	656
Ivašić-Kos, M.	1597	Knežević, T.	34, 40
Ivić, M.	809	Knok, Ž.	1002
Ivković, N.	992	Kobal, D.	614
Ivošević, D.	1409	Kocev, D.	481
Jaakkola, H.	881, 888, 1130	Kochemazov, S.	293, 1561
Jakes, M.	337	Kocijan, K.	1045, 1051
Jakimoski, K.	388	Kocsis, D.	1125
Jakobović, D.	1609	Kokanović, V.	442
Janjić, M.	1051	Kolman, M.	308
Jazbinšek, V.	467	Konecki, M.	988, 992, 1582
Jednoróg, K.	1496	Kopecky, Z.	1078
Jeričević, Ž.	30, 274, 380	Korać, M.	1180
Jerković, H.	1017, 1033, 1644	Kordić, M.	1706
Jerman-Blažič, B.	367	Koren, A.	141, 699
Jesenek, V.	1142	Koričić, M.	46, 51
Jevtić, D.	1706	Korobko, A.A.	1729
Jevtić, M.	1547	Kőrösi, G.	907
Jiang, Y.	673	Kos, L.	303
Job, J.	86	Kosec, G.	308, 450
Jovalekic, S.	164	Kosovac, A.	703
Jovanović, V.	1028, 1741, 1774	Kostadinovska, A.	1137
Jović, A.	326	Kovács, J.	348
Jozić, A.	1889	Kovács, L.	269
Jozić, K.	326	Kováč, M.	57
Jugo, I.	1056	Kovačević, H.	1919
Jukan, A.	684	Kovačević, Ž.	783
Jukić, O.	805	Kovačić, B.	1056, 1741, 1774, 1852
Junaković, D.	1254	Kozlovsky, M.	269, 343, 348
Jurin, I.	1300	Kožar, I.	274, 380
Kacsuk, P.	343, 348	Krajačić, S.	1222

Krajček Nikolić, K.	1306	Marčec, M.	1002
Krajnović, S.	1502	Marčetić, D.	1459
Kralevska, K.	673	Marek, J.	1084
Kralj, L.	863, 1258	Marić, F.	1300
Kranjac, M.	383	Marinčić, A.	141, 667
Krašna, M.	957	Marinović, M.	472
Krelja Kurelović, E.	1811	Marjanović, D.	407, 395
Krini, A.	1386	Marković, I.	1300
Krini, J.	1386	Markulić, N.	72
Krini, O.	1386	Marsi, S.	1479
Križanović, K.	472	Martinčić, K.	82
Krvavica, A.	416	Martinčić-Ipšić, S.	1904
Kučak, D.	442	Martinović, G.	1380
Kudelić, R.	1582	Martinović, Ž.	146, 543
Kukolja, D.	326	Martinović, Ž.	146, 543
Kumar A., A.	120	Matić, T.	86
Kumar Singh, S.	684	Mauher, M.	1869
Kurbalija, V.	531	Medved Rogina, B.	353
Kušundžija, E.	1909	Medved, M.	411
Kutaladze, N.	236	Medvet, E.	1479
Kuzle, I.	1538	Meluch, L.	1443
Kuznetsov, V.A.	11, 16	Meng, L.	1437, 1448
Kvatadze, R.	236	Meshchanov, V.P.	95
Laanpere, M.	1115	Meštrović, A.	1904
Lacković, A.	1218	Mihajlović, Ž.	277, 1091
Lamza Maronić, M.	1072	Mihaljević, B.	970
Larionov, A.	1578	Mihaylov, Gr.Y.	550, 562
Lasorsa, I.	719	Mihova, M.	1137
Lassila, P.	515	Mijač, M.	772
Lavrič, P.	401	Mikhailov, A.	1586
Lazić, N.	783	Mikuchadze, G.	236
Ledneva, A.Yu.	11, 16	Mikuličić, N.	277
Legvart, J.	1629	Mikulić, J.	63
Lenac, K.	730	Milardić, V.	1413
Librenjak, S.	1051	Milišić, H.	1914
Likar, Š.	416	Milivojević, Z.N.	1547
Lin, C.	432	Miljković, D.	1352, 1358
Linna, P.	966	Mirković, M.	1203
Livaja, I.	1538, 1895	Miškić-Pletenac, N.	730
Lo Presti, F.	509	Mišlov, R.	110
Lonie, A.	298	Mitrović, N.	68
Lopina, V.	1045	Mlakić, D.	1289
Lovrenčić, S.	988	Mochizuki, H.	46, 51
Lovrić Švehla, Z.	1663	Močibob, E.	1904
Lučev Vasić, Ž.	289, 446	Modebadze, Z.	236
Ludescher, T.	202	Mohorčić, M.	487
Lugarić, T.	1369	Molnar, G.	100
Lugović, S.	1551, 1557	Morita, S.	46, 51
Lukac, D.	1012	Mostarac, P.	146
Lukovac, B.	141	Možnik, D.	1184
M. Marić,	574	Nagul, N.	1566
Maček, D.	230	Nagy, L.	57
Magerl, M.	110	Nakrap, I.A.	95
Major, L.	907	Námestovski, Z.	907
Mäkelä, J.	881, 888, 1130	Nardelli, M.	503
Mäkinen, T.	966	Nenadić, I.	614
Maksimkin, N.N.	1315, 1321	Nepovinnykh, E.A.	196, 1884
Malarić, R.	146, 543	Ni, W.	289, 446
Malatras, A.	1623	Nikitović, A.	1532
Malekian, R.	707	Nikitović, M.	1753
Marasović, K.	970	Nikolovski, S.	1289
Marceglia, S.	719	Nonis, R.	90
Marchewka, A.	1496	Novak, M.	901, 934

Novković, I.	1650	Radchenko, G.I.	196, 1884
Nozhenkova, L.F.	1729	Radojević, B.	761
Nummela, J.	1397	Radošević, I.	1190
Nyarko, E.K.	1490	Raj R.S., R.	130
Obarčanin, K.	1294	Raj, B.	1469
Ogrin, A.	1239	Rajković, E.	1245
Okanović, V.	376	Rak, M.	1936
Okreša Đurić, B.	1603	Ramljak, D.	751
Oliveira, F.	5	Ramljak, M.	1711
Omanović, S.	745	Ramponi, G.	1479
Opila, J.	361	Rantanen, P.	1392, 1397
Ordanić, L.	1863	Rashkovska, A.	481
Orehovački, T.	982, 1165	Rembold, D.	164
Oreščanin, D.	590	Repnik, R.	962
Oreški, D.	1582, 1667	Retschitzegger, W.	263
Orović, I.	569	Révészová, L.	940
Oršolić, P.	116	Ribarić, S.	1459
Osman, I.	1759	Rishiwal, V.	1543
Osrečki, Ž.	40	Risteska Stojkoska, B.	724, 1137
Ostojić, R.	1294	Ristov, S.	208, 218, 420
Ovsenik, L.	1485	Ristovski, A.	218
Pačelat, I.	1254	Rizvić, S.	376
Paić, G.	1039	Rolich, T.	1591
Pajić, E.	1909	Romanenko, A.I.	11, 16
Palata, D.	614	Romano, A.	426
Pale, U.	1924, 1930	Rostamzadeh Hajilari, H.	283
Palestri, P.	90	Rumyantseva, V.D.	20
Paľová, D.	1006	Rutkowski, A.	190
Panwar, S.	1508	Ružić, I.	1235
Paroški, M.	383	Saari, M.	1392
Pata, K.	1115	Sáez-Trigueros, D.	1437
Pauk, L.	1663	Salapura, S.	821, 847
Pauković, G.	640	Salfinger, A.	263
Pavičić, T.	1262	Salopek Čubrić, I.	869
Pavić, T.	791	Salopek, D.	826
Pavlić, Z.	1369	Samkharadze, I.	236
Pavlina, K.	1039	Samotan, V.	1899
Pein, B.	982	Sanchez, I.	1623
Pellegrino, F.A.	1479	Savin, A.N.	95
Petrova-El Sayed, M.	190	Schatten, M.	1603
Petrović, I.	1300	Schatzberger, G.	63
Petrovska, S.	1547	Schindler, F.	1443
Pflanzner, T.	497	Schuller, B.	190
Pighin, M.	1375	Schulze, J.	5
Pirker, J.	929	Schwinger, W.	263
Pobar, M.	1597	Sedinić, I.	1663
Poljak, N.	1895	Semenov, A.	293, 1561
Poplas Susič, T.	456	Sertić, M.	1174
Popović, B.	370	Sharifi, M.	283
Popović, G.	1924	Shilov, I.P.	20
Popović, Ž.	584	Shimojo, S.	257
Posavec, N.	24	Shopov, M.P.	314, 1348
Prazina, I.	376	Sidorov, I.A.	242, 247
Prohaska, Z.	996	Sikimić, U.	383
Prohaska, Z.	996	Sillberg, P.	1392, 1397
Pröll, B.	263	Simić, I.	383
Pršeš, K.	376	Sinanović, H.	1914
Pun, S.H.	289, 432	Singh, R.	1469
Pürcher, P.	929	Sirotić, I.	152
Putnik, Z.	766	Skala, K.	175, 298
R, R.	120, 126, 130	Skendžić, A.	1852
Raczkowski, K.	72	Slak, J.	450
Radan, A.	1033	Slamić, G.	1017

Slavuj, V.	1056	Šurić, J.	1262
Smrke, A.	1327	Talebi, M.M.	283
Soini, J.	1392, 1397	Tan, Z.-H.	1448
Soliman, M.	894	Taneski, V.	1680
Solus, D.	1485	Tasić, J.	420
Sović, M.	962	Tašpinar, N.	558
Sretenović, M.	1741, 1774	Taylor, J.	298
Sruk, V.	1409	Teder, S.	1115
Stančić, A.	736	Telenta, M.	303
Stanić, U.	456	Temerinac, M.	923
Stanković, I.	569	Tepeš, B.	1039
Stanković, S.	574, 569	Thürk, F.	1930
Stapić, Z.	772	Tijan, E.	1769, 1852
Stockreiter, C.	110	Tikvić, I.	1311
Stojanović, A.	783	Tokárová, I.	1443
Stojanović, Ž.	1919	Tomes, L.	929
Stóka, G.	1125	Tomić, S.	383
Stopjaková, V.	57	Tomljanović, J.	1811
Stoyanov, I.S.	550, 562	Tonkovikj, P.	976
Strahonja, V.	772, 1753	Topolčić, L.	1222
Strmečki, D.	934	Tošić, M.	521
Strujić, Dž.	370	Tošić, M.	628
Sučić, S.	332	Trbalić, A.	462
Sukhinskiy, I.V.	1884	Trengoska, J.	707
Suligoj, T.	34, 40, 46, 51	Tretinjak, M.	1250
Suljanović, N.	650	Trivodaliev, K.	1137
Sun, Z.	1448	Trobec, R.	481
Sušanj, D.	253, 380	Tucaković, Z.	1879
Svoboda, V.	337, 1084	Tudić, V.	24
Sylejmani, K.	1527	Turán, J.	1485
Šabec, J.	622	Turina, T.	1811
Šakić, K.	1699	Tusun, S.	152
Šarić, E.	1914	Tutek, Ž.	1215
Šarić-Kekić, N.	1863	Ul'yanov, S.A.	1315
Šegmanović, F.	40	Ungermanns, C.	1121
Šegvić, M.	1306	Upadhyay, V.P.	1508
Šerifović-Trbalić, A.	462	Urem, F.	1222, 1225, 1254
Ševo, M.	1895	Uroda, I.	996
Šikić, M.	472	Vai, M.I.	289, 432
Šimunić, D.	141, 667, 699	Varga, M.	1786
Šipuš, D.	579	Vaser, R.	472
Šitin, I.	946	Veiga, L.	634
Škoda, P.	353	Veispahić, A.	703
Škorić, I.	982	Vejačka, M.	1023
Škorjanc, T.	841	Venuti, A.	1271
Škorput, P.	656	Vidas-Bubanja, M.	1780
Škrbić, M.	599, 606	Villari, M.	426
Škvorc, D.	1369	Vinko, D.	116, 135
Šneler, L.	86	Vittori, M.	1479
Šojat, Z.	175	Vlahović, N.	1572
Šokac, D.	1196	Vlaović, J.	135
Šolić, K.	1174	Vojković, G.	1694
Šoša Anić, M.	791	Vračić, T.	1786
Šovčik, M.	57	Vrana, R.	875, 1067
Špeh, I.	1834	Vranešić, P.	1017, 1033, 1644
Špoljarić, M.	1339	Vrbovčan, I.	791
Špoljarić, T.	1339, 1889	Vresk, T.	1403
Štajcer, M.	590	Vrhovec, S.L.R.	436, 1364, 1635, 1639
Štajcer, M.	590	Vučić, M.	100
Štefan Trubić, M.	1190	Vujisić, G.	1311
Štimac, M.	826	Vukmirović, S.	1161
Štokić, N.	644	Vuković, M.	1706
Štruc, V.	1433	Vunarić, I.	1230

Vyroubal, V.	736	Zinterhof, P.	320
Wambacq, P.	72	Zmijanac, M.	1420
Watashiba, Y.	257	Zorić, B.	1380
Weber, M.	713	Žagar, M.	1936
Weiss, B.	110	Žeželj, B.	831
Werth, W.	1121	Žigulić, R.	841
Khafa, V.	185	Žilak, J.	46, 51
Yakovleva, G.E.	11	Žilić, T.	814
Yamanaka, H.	257	Žitnik, T.	640
Zaikin, O.	293, 1561	Žižić, A.	946
Zdravevski, V.	208	Žlof, V.	821, 847
Zekanović-Korona, Lj.	1841	Žunić, B.	1521
Zekić-Sušac, M.	1747	Žunić, E.	1521
Zimmermann, H.	68		

FOREWORD

The 39th *International ICT Convention MIPRO 2016* was held from 30th of May until 3rd of June 2016 in Opatija, the Adriatic Coast, Croatia. The Convention consisted of nine conferences under the titles: *Microelectronics, Electronics and Electronic Technology (MEET)*, *Distributed Computing, Visualization and Biomedical Engineering (DC VIS)*, *Telecommunications & Information (CTI)*, *Computers in Education (CE)*, *Computers in Technical Systems (CTS)*, *Intelligent Systems (CIS)*, *Information Systems Security (ISS)*, *Business Intelligence Systems (miproBIS)*, *Digital Economy and Government, Local Government, Public Services (DE/GLGPS)*. A special conference was dedicated to the works of students: *MIPRO Junior-Student Papers (SP)*. Along with this, special sessions on *Biometrics & Forensics & De-Identification and Privacy Protection (BiForD)* and *Future Networks and Services (FNS)* were also held as a part of convention MIPRO.

The papers presented on these conferences and special sessions are contained in this comprehensive Book of Proceedings. All the papers were reviewed by an international review board. The list of reviewers is contained in the Book of Proceedings. All the positively reviewed papers are included in the Book of Proceedings. These papers were written by authors from the industry, scientific institutions, educational institutions, state and local administration.

The convention was organized by the Croatian ICT Society MIPRO with the help of numerous patrons and sponsors to whom we owe our sincere thanks. We specially single out our golden sponsors Ericsson Nikola Tesla, T-Croatian Telecom and Končar-Electrical Industries and silver sponsor InfoDom. Our bronze sponsors are HEP–Croatian Electricity Company, Hewlett Packard, IN2, Transmitters and Communications and Storm Computers.

To all who helped organizing the 39th International ICT Convention *MIPRO 2016* as well as editing of this Book of Proceedings we extend our heartfelt thanks.

Prof. Petar Biljanović, PhD
International Program Committee
General Chair

ICT technologies and structured dialogue: experience of "Go, go, NGO!" project

Nikola Kadoić*

* Faculty of organization and informatics, Pavlinska 2, Varaždin
nkadoic@foi.hr

Abstract - Structured dialogue can be defined as communication between the decision makers – government units (local, regional, national, European) – and citizens who act personally or through different organizations, such as institutions, enterprises, associations (non-governmental organizations, NGOs) or groups. The main focus of this paper is determine importance of ICT in that process. Paper contain presentation of a methodology which will help increase the level of structured dialogue between local government units (LGUs) and associations (NGOs), especially when it comes to NGOs dealing with the younger population. The suggested methodology has been applied in the project "Go, go, NGO!" and the resulting ideas should help increase the structured dialogue level in 5 local government units. Some of those ideas include the application of ICT technologies. Project included a city and 4 municipalities. All have a development index below the average of the Republic of Croatia and are a part of a county with development index below 75% of Croatian average. Project results show improvement of the structured dialogue, but also the significant role that ICT technologies played in that process. Naturally, we cannot expect the improved structured dialogue to have an immediate impact on the development index, but it can have long-term effects.

I. INTRODUCTION

In the scope of this paper, the term *structured dialogue* refers to the dialogue with the youth through government units. The structured dialogue is defined as a process through which public bodies (on local, regional, national and European level) ask the citizens and consult with them on various important topics [1]. This dialogue encompasses not only the youth and decision makers who discuss certain topics but also different institutions, organizations, associations, groups, experts, and individuals. According to a report of the European Youth Forum, the highest non-governmental youth body in Europe, the structured dialogue in Europe is defined through: (1) National Working Groups consisting of representatives from National Youth Council(s), the ministry in charge of youth affairs; (2) national agencies that lead Youth in Action program and conduct consultations with the young people and policy makers at national, and, whenever possible, local and regional levels; and (3) European Steering Committee, consisting of representatives from European Commission, the Trio presidency and the European Youth Forum that compiles the reports, including inputs from national working groups, international non-governmental youth organizations and other international partners, into one or

more background documents intended for an EU Youth Conference [2].

Although these bodies define how structured dialogue should be carried out (strategic view), problems arise at a local (operational) level where the structured dialogue is implemented through youth councils, local governments units, non-governmental organizations, and institutions. Implementation of the structured dialogue in local government units is often hampered by the fact that there are no youth experts who could direct the decision makers in the right path of action. One research on a local level found that the decision makers do not even know what a structured dialogue is [3]. Eurodesk and Agency for Mobility and EU Programs conducted a survey on how the structured dialogue is put into practice in Croatia [4]. Because the survey included various groups (not only on a local level), the results were somewhat better.

The project "Go, go, NGO!" aimed to improve the structured dialogue mainly on a local level – in small cities and municipalities – and was carried out in 5 local government units. Their development index is below Croatian average in 2013 [5]. LGUs have very low amount of funds set aside for the structured dialogue. First present state analysis showed:

- All LGUs have low budgets; they do not have an employee dealing with the structured dialogue. In most cases, they do not employ young people nor people with expertise in managing a structured dialogue.
- LGUs have no youth councils established, no local programs defined, youth policies or any other contents recommended by the European Commission (mainly because they are not aware of them).
- The youth support in LGUs for the most reflects through (low) scholarships and school transport co-financing, but that system is not well organized and offers no support to the young people who leave LGUs after graduating. Most of the young people relocate to bigger cities.

The young people who took part in the project and live in the participating LGU also did not know the meaning of the structured dialogue. They can be categorized into a single group – youth with fewer opportunities who face geographical obstacles (sometimes even economic obstacles) [6].

LGUs do support various social initiatives put in motion by institutions, non-governmental organizations, schools, groups of (young) people and individuals, but the support system is not always transparent nor clear.

The main project goal was to increase the structured dialogue level, but there were also some subgoals: (1) building a transparent support system for NGO sector; (2) establishing youth councils; and (3) stimulating youth participation in NGOs. To achieve those goals, we created a methodology designed to increase the structured dialogue level by using the Four-Phase PDCA (Plan-Do-Check-Act) Model (Deming's Cycle) in combination with the BSC (Balanced Scorecard) [7].

II. STRUCTURED DIALOGUE AND USING ICT TO ESTABLISH AND MAINTAIN A STRUCTURED DIALOGUE

Literature review showed that there is no a lot of examples of organized conducting of structured dialogue and using ICT in that process, especially in small cities and municipalities in Croatia. Before describing the methodology, we will mention a brief analysis of papers dealing with the structured dialogue and youth.

- Authors of the paper [8] explored the possibilities of a structured dialogue between Turkish and Greek communities in Cyprus. Using the Structured Dialogic Design Process, they proposed 27 options (for establishing dialogue) and developed an influence map.
- A structured dialogue can also be achieved through volunteering on different projects in local governments. Survey [9] explored the role of local government agencies in attracting and managing volunteers.
- Youth councils, for the most part funded by adults, can significantly contribute to local communities. The paper [10] describes the successes and perceived challenges of youth councils.
- NGOs and LGUs can efficiently collaborate and successfully deal with employment problems. NGOs play an active role in the implementation of the ALMPs in Finland and Sweden by (1) employing the long-term unemployed; (2) providing social services, mobilizing local resources and undertaking other types of activities that create jobs for the unemployed; and (3) providing voluntary work to volunteers – some of whom acquire skills that can help find a job in the open labor market [11].
- Engbers investigated the characteristics of the most civic cities in the US and concluded that institutional factors unite cities with the highest levels of participation. These include a strong corporate presence, mobilization mechanisms, strong community identity, public spaces, good government and investment in youth. In our case, the above mentioned factors were only partially present [12].

Many LGUs use various ICT solutions that help them in their everyday work. In the case of LGUs using ICT solutions to establish and maintain a structured dialogue, we can say that there is a lot more potential there waiting to be explored and implemented.

- Paper [13] describes various classifications, possibilities and uses of ICT in local government administration. In the structure dialogue process, we can identify ICT solutions and their advantages and disadvantages in relation to their benefits, costs, risks, and impacts.
- Using ICT, LGUs can create a culture of transparency [14].
- Planas, Soler, and Vilà proposed an assessment tool – System of Assessment Indicators for Local Government Youth Policies (<http://siapjove.udg.edu/>), which provides both quantitative and qualitative indicators through which youth policy managers, with relative ease, can obtain assessment reports in 12 possible youth policy areas of assessment [15].
- The emergence of social media, mobile technologies, Web 2.0 and the connected government do not play a truly significant role in the quest for e-government individually, but only in combination with other factors as discussed in [16].
- In the paper [17] Agostino analyzed 119 Italian municipalities and examined in what way do social media stimulate public engagement. YouTube is used to support public communication and Facebook to support public participation.
- The Civitas Initiative provides a set of guidelines addressed to cities that want to start building their own social media communication strategy, but could also be useful in cities that already have a social media strategy in place and would like to improve it [18].

III. METHODOLOGY FOR INCREASING THE STRUCTURED DIALOGUE LEVEL

The project methodology was created with the goal of increasing the structured dialogue level through the project "Go, go, NGO!" and was based on the Deming cycle [19]:

- PLAN: designing or revising business process components in order to improve results
- DO: implementing the plan and measuring its performance
- CHECK: assessing the measurements and reporting the results to the decision makers
- ACT: deciding which changes are needed to improve the process

TABLE I. PHASES OF THE PROPOSED METHODOLOGY FOR INCREASING THE STRUCTURED DIALOGUE LEVEL

PDCA	Goals	Methods/techniques	Outputs
Plan	Formulate the central problem Problem analysis Define goals Create potential solutions	Present state analysis Problem tree SWOT Forming strategies Brainstorming Case studies	Concrete activities that could help improve the structured dialogue
Do	Describe all defined activities	Resource allocation analysis Cost-benefit analysis Scenarios analysis Debate, discussion In-depth analysis	Detailed description of each activity implementation (costs/resources needed and benefits expected)
Check	Present analysis of all activities	Presenting analyses; Case studies	Analysis of costs, resources and benefits in all activities
Act	Select activities that will be applied	Structured dialogue: discussion (Evaluation)	BSC strategic map of goals
Plan	Implement selected activities	Creating an action plan (defining deadlines, responsibilities, budget) for each activity	Implementation plan BSC strategic map of measures
Do	Implement all activities	Implementation Creating checkpoints	Implementation results (measure values achieved following implementation)
Check	Present implementation results	Case studies	Activity implementation analysis
Act	Evaluate implementation results	Qualitative and quantitative analysis	Determining the reached structured dialogue level

In our approach, we applied two Deming cycles: first on a theoretical level (without any application in practice) and then on a practical level. Of course, the Deming cycle implies a continuous process, and when the second cycle is completed, a new one can be applied for additional improvement. Our approach uses the not-for-profit BSC as a performance management system [20], [21].

The methodology is presented in Table 1. In the beginning, we had to define a central problem, as well as other related problems. The central problem referred to the existing structured dialogue level, and the related problems were its sources (causes) or consequences (e.g. an LGU has no established youth councils; there is no support for NGOs; citizens do not understand many of the decisions made by the LGU's decision makers, etc.). The following methods and techniques can be used in defining the problems: a problem tree, case study analysis and present state analysis. Also in that phase, possible solutions need to be suggested. In the BSC, that means that we had to set strategic goals we wanted to achieve. After setting the strategic goals, we had to do a SWOT analysis for each goal and pair the identified SWOT elements to create strategies and alternatives, i.e. activities that will help increase the structured dialogue level. Other methods that can help create such activities include brainstorming and case study analysis – good practices from other local government units. As the example of one of the five LGUs participating in the project will show, some of the identified activities are connected with the implementation of ICT technologies, social networks, and web 2.0 tools.

In the DO phase, all generated activities need to be described. We needed to identify (1) the benefits of activities in relation to the post-implementation structured dialogue level and inputted (2) cost and (3) resources. To identify these elements, we used a cost-benefit and resource allocation analysis or scenario analysis (trying to predict the process of implementing each activity, as well

as possible pitfalls, reactions, and results). In the CHECK phase, we presented the identified activities and cost-benefit-resource results to the decision makers. In the ACT phase, the decision makers had to select activities that would go into the implementation phase, keeping in mind their individual but also their combined effects. It is recommended to complete both the CHECK and ACT phase on the same day/at the same meeting. Personal attendance of the decision makers (not their delegates, i.e. LGU's employees) is also recommended because these are crucial moments in making the most important decisions. If possible, an additional group (i.e. people who did not generate ideas) should also take part in the process and evaluate the selected activities.

As shown in Table 1, the first PDCA cycle is purely theoretical, without any implementation. The prescribed methodology here entails dialogue steps that both the decision makers and young people (NGOs) have to take. We can say that *to increase the structured dialogue level, we have to use a methodology based on the structure dialogue mechanism*. The second PDCA cycle takes place on a more practical level.

In the PLAN (2) phase, we needed to create implementation plans (action plans) for all activities selected in the ACT (1) phase. The result was a BSC strategic map of goals. Deadlines, responsibilities, resources and other important elements had to be defined for each goal in the map. (It was at this stage of our project that the heads of the LGUs signed documents containing that information.) During the implementation phase, i.e. the DO phase, selected activities were executed and monitored. We also had to create a BSC strategic map of measures. For each measure, we defined four target values: U, u, 1 and L [22]. Values between U and u suggest *good goal achievement*, values between u and 1 show *satisfactory goal achievement* and values between 1 and L indicate *poor goal achievement*. The person in charge of the activity oversaw its implementation. The

CHECK phase starts when the last action plan activity finishes. If there are many activities, it is recommended to define a checkpoint before the final check. In this phase of our project, the analysis of each activity implementation was done – we had to check whether the BSC strategic map goals had been achieved. We also drew conclusions on the measured values in the map of measures and goal efficacy (achievements).

In the case of more complex problems, software use is recommended. In our case, calculations were made in Excel. However, Dialog strategy is a more appropriate software because it enables dynamic monitoring of goal achievements through scorecard graphs [22].

The proposed methodology was tested during the course of the project "Go, go, NGO!" project and gave very good results. More methods per methodology phase can be counterproductive in the application domain of both LGUs and the young people.

IV. CASE STUDY: PROJECT "GO, GO, NGO!"

The following part of the paper presents the application of the methodology in the case study of the project "Go, go, NGO!". As mentioned earlier, project covered five LGUs, but this presentation will deal with the results (DO (2)) of only one of them. Similar results were achieved in the other four LGUs.

The project was structured in the form of six three-day meetings. At each meeting some methodology phase(s) was (were) carried out. Approximately 50 participants were present at the meetings and assignments were executed in groups. The decision makers did not attend all meetings – other LGU's employees took their place at some. After completing each assignment, groups exchanged their results.

At the first meeting, the following activities were implemented: theoretical presentation on the structured dialogue; presentation on results of an income survey previously filled out by project participants (both the young NGO representatives and decision makers from LGUs); presentations on good practices in relation to the structured dialogue and case studies; brainstorming on possible activities that could be implemented in the LGU to increase the structured dialogue level; learning about the *problem tree* method: theory and examples; making a problem tree for three problems: *low structured dialogue level*, *weak support of NGOs by LGUs* and *weak motivation of the young people for active involvement in the community social life*; brainstorming on how to influence problem causes in the created problem trees; learning about *SWOT* in theory and practice; making *SWOT* analysis for two strategic goals: *increasing the LGUs' support of NGOs* and *making LGUs totally transparent and motivating the young people to be active participants in the community social life*; making strategies (grouping *SWOT* elements and creating logical activities); presenting examples of a good structured dialogue from a partner institution. The resulting activities stemming from the previously mentioned ones were candidates for implementation in the LGU.

At the second meeting, each activity was analyzed and described in detail. The goal of the meeting was to create an in-depth analysis of each idea. Participants completed resource analysis and cost-benefit analysis for each idea. They also carried out a scenario analysis – they tried to implement ideas on a theoretical, debate level and then to identify possible problems during the actual implementation. Young participants offered arguments and promoted benefits for each idea they wanted to implement. LGUs also weighed in with their perspectives, opinions, and experiences. Both evaluated each idea on a scale of 1 – 10, where 1 and 10 denoted low and high contribution to the structured dialogue level in the LGU, respectively. (Evaluations are depicted in Table 2, columns 2 and 3.) Then, the structured dialogue was presented at a meta-level – activities that would help increase the structured dialogue level in the LGU were decided via structured dialogue mechanism (discussions, debates, case studies, personal reflections). Logically, one generated idea was to promote this project and foster similar ones.

At the third meeting, all of the results were presented to the decision makers and they had to decide which will be selected for implementation, bearing in mind costs and resources needed, but also the benefits that will each LGU reap through implementing each action. The young people presented activities and their arguments. In our case, not all of the proposed actions were accepted because, even though some of them do not require a lot of resources individually, their joint implementation was simply not possible.

LGU that is the case of our study selected the following activities: (1) organization of panel discussions and public debates dealing with the functioning of the LGU or the upcoming decisions; (2) influencing youth activities implemented by the county because until now they were for the most part located in other LGUs in the county; (3) introduction of an *LGU open day*; (4) supporting the state change of the law dealing with the establishment of youth councils (under the current law, youth councils members are primarily selected by LGU's council members, not by the young people whom they should represent); (5) activities directed toward educating elementary and secondary school students on LGUs and youth councils; (6) electing the children's mayor; (7) inviting applications for the LGU's youth council; (8) supporting NGOs by enabling their meetings and other appropriate indoor activities that are under the LGU's jurisdiction. Finally, the following activities included ICT solutions:

- (9) Opening a Facebook profile and maintaining continuous communication with citizens. Considering that many of them, especially the young people, use Facebook on a daily basis, this should ensure better communication and a direct dialogue.
- (10) Recording LGU's council sessions. Every citizen who wants to know how certain council session evolved, could contact the LGU and get an audio copy of the session;

- (11) Head of the LGU makes a guest appearance every month on the local radio. However, due to the broadcast time, not many citizens can actually hear the show. The idea is to, in agreement with the local radio, record the show, upload it to a hosting service (such as YouTube) and make it available to a larger audience at any time and place.

Also, one of the selected activities was to (12) support NGOs via public tender (competition) for the allocation of funds for NGO projects. The current practice is that in most cases it is the mayor who approves or denies funds following individual NGO's requests; the process is not always fair nor transparent. Three items could play a role in the implementation of ICT solutions:

- Internet articles and blogs dealing with the NGO's activity will be accepted as proof of the applied NGO's attainment (for now, only paper references are accepted).
- All information about the tender (competition) will be available online, as well as all the reports on how the money is spent (the list of NGOs that applied, got funding and the amount of funding).
- In future activities, an appropriate system will be implemented to help organize tender documentation, applications, results, etc. So far, Moodle seem to be a successful solution, because it enables user registration (NGO's members and experts who can evaluate project proposals); discussions; uploading documents by the LGU; uploading applications by the NGOs; evaluating applications by evaluators using transparent criteria that can easily be implemented via rubrics option in Moodle; publishing announcements, results and other relevant information; creating surveys, etc.

The listed activities were grouped with the BSC perspective and BSC strategic map of goals shown in Figure 1.

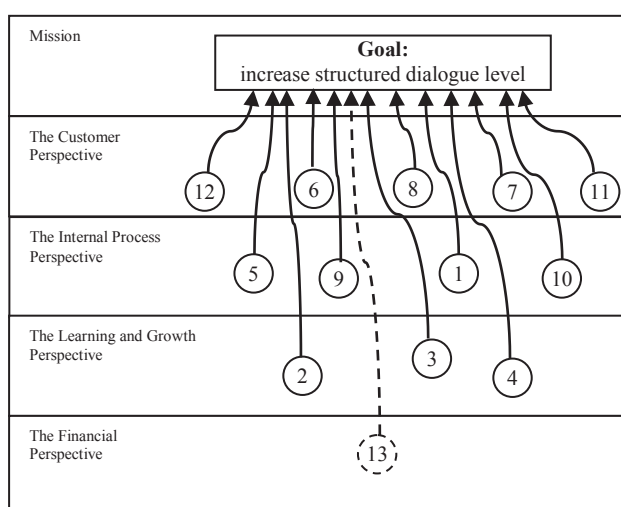


Figure 1. The BSC strategic map of goals (map includes goal 13: writing new project proposals, similar to "Go, go, NGO!")

At the fourth meeting, as recommended in the methodology, additional evaluation of the selected activities (from the previous meeting) was done. Representatives from an LGU that did not participate in the project gave their opinions and recommendations on the selected ideas. That information proved valuable for the following phase and meetings (creation of an action plan). Besides that, project participants learned about new case studies on implementing structured dialogue.

At the fifth meeting, a BSC strategic map of measures was defined: people in charge, deadlines, resources needed and implementation description. That data was included in the *Decision about implementations of selected project activities*, signed by the mayor and presented to every NGO in the LGU.

The time period between the fifth and sixth meeting was reserved for the implementation of every selected activity (DO (2)). After an activity had been implemented, the structured dialogue level was recalculated (based on the BSC strategic map of measures). Table 2 shows the implementation of the BSC strategic map of measures in MS Excel, where the structured dialogue level was calculated. The possible contribution to the structured dialogue for each activity was evaluated at the second meeting. Also, the average contribution of the NGO's and LGU's grade was calculated (column 4)). Those values became weights in measuring the structured dialogue level. During the structure level measuring, we had to evaluate the completeness of each activity implementation. We used a 0-10 scale for that – 0 meant that certain activity had not been implemented, and 10 meant that the activity had been implemented in full. Then, we calculated the structured dialogue level for each activity by multiplying the weight (the possible contribution of each activity in improving the structured dialogue level) and the grade describing the implementation completeness. Columns 5 and 6 contain data on the structured dialogue level before the project had started in the selected LGU. Columns 7 and 8 contain data showing what the structured dialogue level would be if all selected activities were fully implemented.

TABLE II. IMPLEMENTATION OF BSC STRATEGIC MAP OF MEASURES

A. No	Contribution to structured dialogue			Implementation of activities					
				Before project		Maximum		Achieved	
	NGO	LGU	AVG	Grade	Result	Grade	Result	Grade	Result
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	9	6	7.5	2	15	10	75	3	22.5
2	5	2	3.5	0	0	10	35	10	35
3	5	4	4.5	0	0	10	45	0	0
4	2	1	1.5	2	3	10	15	3	4.5
5	9	7	8	0	0	10	80	3	24
6	10	8	9	0	0	10	90	5	45
7	5	4	4.5	5	22.5	10	45	3	13.5
8	8	5	6.5	8	52	10	65	10	65
9	7	5	6	0	0	10	60	8	48
10	7	5	6	0	0	10	60	10	60
11	10	10	10	0	0	10	100	0	0
12	10	10	10	0	0	10	100	5	50
TOTAL				92.5		770		367.5	

The sixth meeting is planned at a later date than the publication of this paper. According to plans, at that meeting, the final evaluation of implementation completeness will be done, phases CHECK (2) and ACT (2). In Table 2, last two columns contain data on the current state of each activity implementation.

If we observe only activities 8-12, dealing with the use of ICT solutions, we can conclude that their implementation can contribute a maximum of 320 points to the structured dialogue level, i.e. 41.55% of total structured dialogue level points. This only shows how big of a role ICT plays in the structured dialogue level.

V. CONCLUSION

The goal of this project was to increase the structured dialogue level in small government units (LGUs): municipalities and small cities. For this cause, we proposed a methodology and applied/tested it during the course of the "Go, go, NGO!" project.

In order to increase communication with NGO sector and citizens, LGUs opened Facebook profiles. That enabled two-way communication and better visibility of information that were originally published only on web page. 100% of young participants from project find this way of communication more practical for them because so far they didn't have a habit visiting web page of LGU, and now, when information are linked to the Facebook, they got information on social network which they use on daily basis. Even though some of the information that are published are not understandable for them, young participants became aware of complexity of LGU's business processes.

When recordings of LGU's council sessions become available for the public, two main benefits of implementing this activity were identified. One is related to better preparedness of council members – now when everything is recorded and available to the public, inactive council members (who don't give any ideas as a solution to problems that are discussed) are identified. Second benefit is related to involvement of citizens in decision making processes. Similar benefits are achieved when talking about recording LGU's head appearance on local radio (when the recording became available to the public).

ICT technologies enhanced the process of support NGOs via public tender (competition) for the allocation of funds for NGO projects in all phases: dissemination, receiving project applications and evaluation of application. In the same time, conducting this activity by using ICT helped both, NGOs and LGUs to understand the applying process to EU funds.

ACKNOWLEDGMENT

This work has been partly supported by European Commission under the project "Go, go, NGO!" (Erasmus+ program, project number: 2014-2-HR01-KA347-012471), implemented by Culture and Art Society Belec (KUD Belec, Croatia) and "Alexandru Stefulescu" Gorj County Museum (Romania).

REFERENCES

- [1] S. Commission, "Strukturirani dijalog u Hrvatskoj | European Youth Portal." [Online]. Available: http://europa.eu/youth/node/20097_ro.
- [2] European youth forum, "Position paper on structured dialogue," 2015.
- [3] Zlatar Youth Association, "Being young in EU - How to start?," 2013.
- [4] D. Potočnik, "Strukturirani dijalog s mladima u Republici Hrvatskoj," 2011.
- [5] M. regionalnoga razvoja i fondova E. Unije, "Vrijednosti indeksa razvijenosti i pokazatelja za izračun indeksa razvijenosti 2013.," 2013. [Online]. Available: <https://razvoj.gov.hr/o-ministarstvu/djelokrug-1939/regionalni-razvoj/indeks-razvijenosti/vrijednosti-indeksa-razvijenosti-i-pokazatelja-za-izracun-indeksa-razvijenosti-2013/3214>. [Accessed: 18-Jan-2016].
- [6] Salto Youth, "Young people with fewer opportunities," 2016. [Online]. Available: <https://www.salto-youth.net/tools/otlas-partner-finding/help/young-people-with-fewer-opportunities/>. [Accessed: 18-Jan-2016].
- [7] R. S. Kaplan, "Conceptual Foundations of the Balanced Scorecard," *Handbooks Manag. Account. Res.*, vol. 3, pp. 1253–1269, 2009.
- [8] Y. Laouris, A. Erel, M. Michaelides, M. Damdelen, T. Taraszow, I. Dagli, R. Laouri, and A. Christakis, "Exploring Options for Enhancement of Social Dialogue Between the Turkish and Greek Communities in Cyprus Using the Structured Dialogic Design Process," *Syst. Pract. Action Res.*, vol. 22, no. 5, pp. 361–381, Oct. 2009.
- [9] E. Choudhury, "Attracting and managing volunteers in local government," *J. Manag. Dev.*, vol. 29, no. 6, pp. 592–603, Jun. 2010.
- [10] C. D. O'Connor, "Engaging Young People? The Experiences, Challenges, and Successes of Canadian Youth Advisory Councils," 2013, pp. 73–96.
- [11] T. Babila Sama, "Role of NGOs in the implementation of active labour market policies," *Int. J. Leadersh. Public Serv.*, vol. 8, no. 3, pp. 121–143, Aug. 2012.
- [12] T. A. Engbers, "Building community? The characteristics of America's most civic cities," *J. Public Aff.*, Apr. 2015.
- [13] U. Sivarajah, Z. Irani, and V. Weerakkody, "Evaluating the use and impact of Web 2.0 technologies in local government," *Gov. Inf. Q.*, vol. 32, no. 4, pp. 473–487, Oct. 2015.
- [14] J. C. Bertot, P. T. Jaeger, and J. M. Grimes, "Using ICTs to create a culture of transparency: E-government and social media as openness and anti-corruption tools for societies," *Gov. Inf. Q.*, vol. 27, no. 3, pp. 264–271, Jul. 2010.
- [15] A. Planas, P. Soler, and M. Vilà, "Assessing youth policies. A system of indicators for local government," *Eval. Program Plann.*, vol. 45, pp. 22–28, Aug. 2014.
- [16] E. Claver-Cortes, S. de Juana-Espinoso, and J. Valdés-Conca, "Emerging and Traditional ICT as Critical Success Factors for Local Governments," in *Emerging Mobile and Web 2.0 Technologies for Connected E-Government*, IGI Global, 2014, pp. 258–279.
- [17] D. Agostino, "Using social media to engage citizens: A study of Italian municipalities," *Public Relat. Rev.*, vol. 39, no. 3, pp. 232–234, Sep. 2013.
- [18] CIVITAS WIKI, "The use of social media to involve citizens in urban mobility projects and city planning," 2015.
- [19] P. Averson, "The Deming Cycle," *Balanced Scorecard Institute*.
- [20] M. Martello, M. J. Fischer, and J. G. Watson, "Implementing a Balanced Scorecard in a Not-For-Profit Organization," *J. Bus. Econ. Res.*, vol. 6, no. 9, pp. 67–80, 2008.
- [21] Z. Dobrovic, M. Tomicic, and N. Vreck, "Towards the Effective E-Government Implementation of Balanced Scorecard in Public Sector," *Intelekt. Ekon.*, vol. 8011, no. 1, pp. 7–17, 2008.
- [22] J. Brumec, M. Tomičić, and S. Brumec, "Konstrukcija mjernih instrumenata za Balanced Scorecard," *Proc. 18th Conf. Methods Tools Inf. Bus. Syst. Dev.*, pp. 21–30, 2006.