ISSN 1847-3938

mipro 2016

organizer mipro

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

IEEE

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. Anđelić, 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

CONTENTS

DISTRIBUTED COMPUTING, VISUALIZATION AND BIOMEDICAL ENGINEERING

INVITED PAPER

PAPERS

DISTRIBUTED COMPUTING AND CLOUD COMPUTING

VISUALIZATION SYSTEMS

BIOMEDICAL ENGINEERING

TELECOMMUNICATIONS & INFORMATION

FNS • SPECIAL SESSION ON FUTURE NETWORKS AND SERVICES

PAPERS

TELECOMMUNICATIONS & INFORMATION

INVITED PAPER

PAPERS

WIRELESS COMMUNICATIONS AND TECHNOLOGIES

DATA AND IMAGE ANALYSIS

NETWORK TECHNOLOGIES

NETWORKS PERFORMANCES

IoT PLATFORM AND APPLICATIONS

SOFTWARE ENGINEERING

TELECOM PRODUCTS, SERVICES AND MARKET

ICT APPLICATIONS

COMPUTERS IN EDUCATION

INVITED PAPER

PAPERS

COMPUTERS IN TECHNICAL SYSTEMS

INVITED PAPERS

PAPERS

INTELLIGENT SYSTEMS

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

KEYNOTE SPEECH

PAPERS

INTELLIGENT SYSTEMS

PAPERS

INFORMATION SYSTEMS SECURITY

PAPERS

TECHNICAL TRACK

SOCIAL ENGINEERING TRACK

MISC TRACK

BUSINESS INTELLIGENCE SYSTEMS

PAPERS

DIGITAL ECONOMY AND GOVERNMENT, LOCAL GOVERNMENT, PUBLIC SERVICES

PAPERS

MIPRO Junior – STUDENT PAPERS

PAPERS

LIST OF PAPER REVIEWERS

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

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

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

AUTHOR INDEX

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	Determing 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.

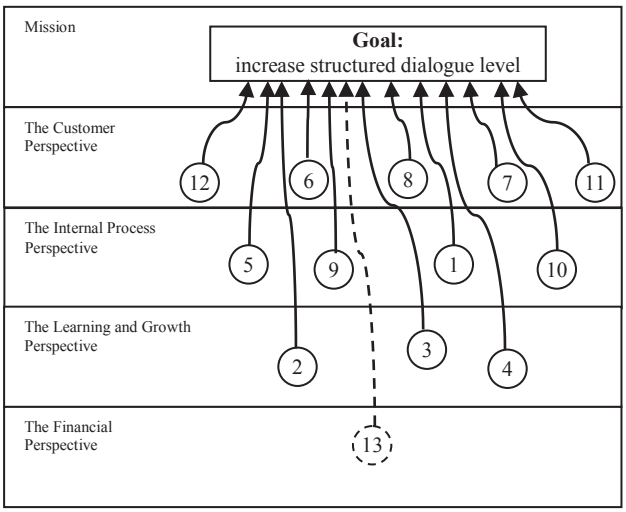

Figure 1. The BSC strategic map of goals (map includes goal 13: writing new project proposals, similar to "Go, go, NGO!")

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. CONLUSION

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-Espinosa, 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. Vrcek, "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.