1ST INTERNATIONAL SYMPOSIUM ON INDUSTRIAL ENGINEERING AND AUTOMATION

MANAGING AND IMPLEMENTING THE DIGITAL TRANSFORMATION

20th–23rd June 2022
Dear Colleagues and Friends,

it is a pleasure for me to welcome you to Italy and Bozen-Bolzano!

I would like to deliver my warm greetings and heartfelt welcome to all participants of the 1st International Symposium on Industrial Engineering and Automation (ISIEA 2022).

The Symposium will provide an opportunity for the presentation of recent results related to both theoretical and applied research in the field of Industry 4.0 and Digital Transformation, bringing together scientists from many different countries from Europe and over the globe. Furthermore, the Symposium includes a Special Session regarding Innovative Higher Education for Industry 4.0.

A very attractive and stimulating social program will be also set up, which will start with a Welcome Aperitivo on Monday evening and it will continue on Tuesday evening with the Social Gala Dinner at Castle Maretsch. On Wednesday afternoon you will visit several labs at the NOI Techpark, South Tyrol’s new research and innovation district. Finally on Thursday morning you will have the opportunity to see hands-on Industry 4.0 applications at our industrial partner company Duka Ag.

Many thanks go out to the members of the Organising Committee, the Scientific Committee and the Paper Award Selection Committee for their support.

We hope you enjoy your stay with us and that this event leads to many stimulating conversations and future collaborations.

Yours
Prof. Dominik Matt
Chair, ISIEA 2022
## Chairs

**Chair**
Prof. Dominik Matt

**Co-Chair**
Dr. Erwin Rauch  
Dr. Patrick Dallasega  
Prof. Renato Vidoni

**Special Session Chair**
Dr. Emmanuel Francalanza

## International scientific committee

**University of Malta**
Dr. Emmanuel Francalanza  
Prof. Jonathan Borg  
Dr. Joseph Paul Zammit

**KTH Royal Institute of Technology**
Dr. Magnus Lundgren

**University of Minho**
Prof. Goran Putnik

**Polytechnic University of Bucharest**
Prof. Catalin Amza

**Chiang Mai University**
Prof. Wasawat Nakkiew  
Dr. Korrakot Tippayawong

**Free University of Bozen-Bolzano**
Prof. Alfredo De Massis  
Prof. Guido Orzes  
Dr. Cristian Cappellini

**Technical University of Kosice**
Prof. Vladimir Modrak  
Prof. Jan Pitel  
Dr. Zuzana Soltysova

**University of Bologna**
Dr. Federico Fraboni

**Frauhofer Italia Research**
Dr. Michael Riedl  
Dr. Andrea Giusti

**University Passau**
Dr. Minica Ciolacu

**Technical University Graz**
Dr. Matthias Wolf  
Prof. Bernd Zunk

**Technical University of Munich**
Dr. Susanne Vernim

**University of Udine**
Dr. Lorenzo Scalera

**University of Modena and Reggio Emilia**
Dr. Fabio Pini

**Montanuniversität Leoben**
Prof. Helmut Zsifkovits  
Dr. Manuel Woschank

**SACS MAVMM Engineering College India**
Prof. R. Sudhakara Pandian

**EURAC Research**
Dr. Roberto Monsorno

**Worcester Polytechnic University**
Prof. Christopher Brown

**University of Applied Science Carinthia**
Prof. Christian Madritsch

**University of Antwerp**
Dr. Cosmin Copot

**Purdue Fort Wayne University**
Prof. David Cochran
Guess what is the biggest room in the world?
Ing. Miloslav Karaffa

Miroslav Karaffa is vice president of Chamber of Commerce of Slovakia. Additionally, he is owner and CEO of ELCOM sro.

NOI Techpark – A Sustainable Industry 4.0 and Digital transformation Enabler
M.Sc.Eng., Executive MBA Vincent Mauroit

Vincent Mauroit is Director of Innovation & Tech Transfer at NOI AG (NOI Techpark in Südtirol–Alto Adige).

Digi-VET Digitally enriched curriculum
Mattias Döbler

Mattias Döbler works in Berlin at the College of Further Education for Information Technology and Medical Equipment Technology. Additionally, he is active in EduNet World Association (EWA).
### Day 1 → Welcome to unibz

Monday 20 June 2022  
unibz – Cafeteria at main entrance

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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</thead>
<tbody>
<tr>
<td>06.00 PM</td>
<td>Get Together and Welcome Aperitivo</td>
</tr>
</tbody>
</table>

### Day 2 → Symposium – Industry 4.0 and Digital Transformation

Tuesday 21 June 2022  
unibz – Room D1.01

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<tbody>
<tr>
<td>08.30 AM</td>
<td>Registration</td>
</tr>
<tr>
<td>09.00 AM</td>
<td>Welcome</td>
</tr>
</tbody>
</table>
| 09.20 AM | Keynote Speech 1  
Prof. Tauno Otto |
| 09.45 AM | Keynote Speech 2  
Ing. Miloslav Karaffa |
| 10.10 AM | Keynote Speech 3  
M.Sc.Eng., Executive MBA  
Vincent Mauroit |
| 10.35 AM | Coffee Break                              |
| 11.00 AM | Technical Presentations                   |
| 12.00 PM | Lunch at unibz Canteen                    |
| 01.30 PM | Technical Presentations                   |
| 02.30 PM | Coffee Break                              |
| 03.00 PM | Technical Presentations                   |
| 04.00 PM | Visit Smart Mini Factory Lab              |
| 07.00 PM | Aperitivo and Get Toghether at Castle Mareccio |
| 07.30 PM | Start of the Social Dinner at Castle Mareccio |
### Day 3 → Special Session Higher Education

**Wednesday 22 June 2022**  
NOI Techpark – Room Seminar 2

<table>
<thead>
<tr>
<th>Time</th>
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<tbody>
<tr>
<td>09.00 AM</td>
<td>Registration</td>
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<tr>
<td>09.10 AM</td>
<td>Welcome</td>
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<tr>
<td>09.20 AM</td>
<td>Keynote Speech 4</td>
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<tr>
<td></td>
<td>Matthias Döbler</td>
</tr>
<tr>
<td>09.45 AM</td>
<td>Technical Presentations</td>
</tr>
<tr>
<td>10.30 AM</td>
<td>Coffee Break</td>
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<tr>
<td>11.00 AM</td>
<td>Technical Presentations</td>
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<tr>
<td>11.45 AM</td>
<td>Panel Session “Synergies and Lessons Learned in Erasmus+”</td>
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<tr>
<td>12.15 AM</td>
<td>Closing and ISIEA Best Paper Award / Best Student Paper Award</td>
</tr>
<tr>
<td>12.30 PM</td>
<td>Lunch at NOIsteria</td>
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<tr>
<td>02.00 PM</td>
<td>Visit NOI Techpark and Visit</td>
</tr>
<tr>
<td></td>
<td>Fraunhofer ARENA lab for Industry 4.0 applications</td>
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<tr>
<td>05.30 PM</td>
<td>Guided sightseeing tour of</td>
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<tr>
<td></td>
<td>Bozen–Bolzano. Meeting point</td>
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<tr>
<td></td>
<td>in front of unibz’s main entrance</td>
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</tbody>
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### Day 4

**Thursday 23 June 2022**  
Field Trip

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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</thead>
<tbody>
<tr>
<td>08.45 AM</td>
<td>Meeting in front of Kolpinghaus</td>
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<tr>
<td></td>
<td>Largo Adolph Kolping, 3</td>
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<tr>
<td></td>
<td>Adolph Kolping Straße 3</td>
</tr>
<tr>
<td>09.00 AM</td>
<td>Trip to Brixen–Bessanone by bus</td>
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<tr>
<td>10.00 AM</td>
<td>Welcome by Duka Ag</td>
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<tr>
<td>10.15 AM</td>
<td>Production Tour with focus on</td>
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<tr>
<td></td>
<td>Industry 4.0</td>
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<tr>
<td>11.30 AM</td>
<td>Duka’s vision towards smart and</td>
</tr>
<tr>
<td></td>
<td>sustainable production</td>
</tr>
<tr>
<td>12.00 PM</td>
<td>Closure and Sandwich Lunch</td>
</tr>
<tr>
<td>01.00 PM</td>
<td>Return to Bozen–Bolzano by bus</td>
</tr>
</tbody>
</table>
Tuesday 21st June

Smart Manufacturing
Session chair: Catalin Gheorghe Amza

11.00 AM Mechatronic handling solution for a robotized pizza-chef assistant
Giovanni Carabin, Ilaria Palomba, Martin Stimpfl, Renato Vidoni

11.15 AM Mechanical property degradation of Polylactic Acid (PLA) 3D printed parts under ultraviolet radiation
Aurelian Zapciu, Gheorghe Amza Catalin, Monica Ciolacu, Emmanuel Francalanza, Erwin Rauch

11.30 AM Transformability in material flow systems: towards an improved product development process
Maximilian Wuennenberg, Pia Vollmuth, Josef Xu, Johannes Fottner, Birgit Vogel-Heuser

11.45 AM Two different numerical approaches for supporting vibration-based structural health monitoring of gear train systems
Ronant de Paula Monteiro, Franco Concli, Renato Vidoni

Al and Data Analysis in Manufacturing
Session chair: David S. Chochran

01.30 PM Information model to advance explainable AI-based decision support systems in manufacturing system design
David S. Cochran, J. Smith Joseph, G. Mark Benedikt, Erwin Rauch

01.45 PM Classification framework for machine learning support in manufacturing
Baris Ördek, Yuri Borianni, Eric Coatanea
<table>
<thead>
<tr>
<th>Time</th>
<th>Session Title</th>
<th>Speakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.00 AM</td>
<td><strong>Introducing and Implementing Industry 4.0</strong></td>
<td>Pedro Pinheiro, Goran D. Putnik, Zlata Putnik, Cátia Alves</td>
</tr>
<tr>
<td>11.15 AM</td>
<td><strong>Industry 4.0. in family firms</strong></td>
<td>Samuel Wayne Appleton, Mirjam Beltrami, Marco Mismetti, Guido Orzes, Dominik Matt, Alfredo De Massis</td>
</tr>
<tr>
<td>11.30 AM</td>
<td><strong>Haze problem solving for resilience living society: a case study in northern thailand</strong></td>
<td>Paipan Thanalerdsopit, Sermkiat Jomjunyong</td>
</tr>
<tr>
<td>11.45 AM</td>
<td><strong>Development of knowledge capability model for Industry 4.0: A Thai SMEs perspective</strong></td>
<td>Poti Chaopaisarn, Anurak Sawangwong</td>
</tr>
<tr>
<td>01.00 PM</td>
<td><strong>Advanced Scheduling and Optimization</strong></td>
<td>Leonilde Varela, Goran Putnik, Catia Alves, Nuno Lopes, Maria Manuela Cruz-Cunha</td>
</tr>
</tbody>
</table>
02.00 PM  Development of a system for the analysis of surface defects in die-cast components using machine vision
Giorgio Cavaliere, Yuri Borgianni, Elena Rampone

02.15 PM  Performance prediction of thin-walled tube energy absorbers using machine learning
Mostafa Ghasemi, Mohammad Silani, Vahid Yaghoubi, Franco Concli

Digital Twin and Simulation
Session chair: Cappellini Cristian

03.00 PM  Development of a FEM model for the digital twin application and the monitoring of Cor-Ten road barriers in the Autonomous Province of Bozen-Bolzano
Lorenzo Pagliari, Chiara Nezzi, Lorenzo Fraccaroli, Franco Concli

03.15 PM  A digital twin approach to automotive wheel flow forming process
Cristian Cappellini, Luca Giorleo, Gabriele Allegri, Aldo Attanasio, Elisabetta Ceretti

03.30 PM  Simulation of heavy duty vehicles for the use in digital twins
Alejandro Secades, Davide Bagnara, Jasper Volmer

03.45 PM  Digital twin in a dairy factory
Sergio Salimbeni, Nahuel Romera, Andrés Redchuk
02.00 PM  Scheduling optimization for mass customized production using simulation tool  
Zuzana Soltysova, Vladimir Modrak, Julia Nazarejova

02.15 PM  Applying Grey relational analysis based multi-response optimization of huskers process parameters in paddy husking machine  
Suwattanarwong Phamphet, Surapong Bangphan, Phiriphan Bangphan, Athiwat Wangmai, Sermkiat Jomjunyong

New Ways of Engineering Education  
Session chair: Manuel Woschank

03.00 PM  Competence-based realignment of engineering education at higher education institutions: using the example of industrial logistics engineering project “CoR-Ilog”  
Manuel Woschank, Corina Pacher

03.15 PM  Learning based on SmartTechLab for I4.0  
Ján Pitel', Kamil Židek, Vladimír Modrák, Alexander Hošovský

03.30 PM  Personnel and area assessment models for thailand provincial industry office toward Industry 4.0  
Apichat Sopadang, Tanyanuparb Anantana, Jutamat Jintana, Yaibuethet Tippayawong Korrakot, Salinee Santiteerakul, Sakgasem Ramingwong

03.45 PM  A contribution to the learning factory architecture implementations for engineering education  
Goran Putnik, Cátia Alves, Leonilde Varela, Pedro Pinheiro
Wednesday 22nd June

NOI Techpark – Room Seminar 2

Innovative Higher Education for Industry 4.0 (I)

09.45 AM
An innovative higher education institution training toolbox to effectively address industry 4.0 skills gap and mismatches
Emmanuel Francalanza, Pierre Vella, Erwin Rauch, Catalin Amza, Magnus Lundgren, Goran Putnik

Session chair:
Emmanuel Francalanza

10.00 AM
Design and implementation of the ICARUS Industry 4.0 mobile training unit
Amberlynn Bonello, Emmanuel Francalanza, Jonathan Borg, Joseph Zammit

10.15 AM
“ICARUS” pedagogical methodologies FRAMEWORK
Goran Putnik, Cátia Alves, Emmanuela Francalanza, Jonathan Borg, Catalin Amza, Erwin Rach, Magnus Lundgren, Leonilde Varela, Pedro Pinheiro

Innovative Higher Education for Industry 4.0 (II)

11.00 AM
Network architecture of ETAT Education and training centers for automation 4.0
Matteo DeMarchi, Prajaks Jitngernmadan, Pongpat Singsri, Norangsak Putpuek, Saman Kumpakeaw, Supaporn Bundasak, Warangkhana Kimpan, Erwin Rauch

Session chair:
Erwin Rauch

11.15 AM
ETAT pedagogical modules for automation 4.0 training program structure in training centres in Thailand
Mateos Felipe, Alvarez Antonio Robles, Arguelles Maria De Los Reyes Poo, Fongsamut Chalermpan, Jitngernmadan Prajaks

11.30 AM
Hands-on PLC training approach for IT students using virtual reality
Kubola Kanuengnij, Jantarakongkul Benchapor, Boonmee Prawit, Jitngernmadan Prajaks
Single ticket for regional trains and buses

A single-fare ticket can be used for a single or return journey by bus or train and for unlimited journeys within 60 minutes made in the same fare zone (Bozen-Bolzano belongs to same fare zone).

→ Fares
15¢ per km and price category (rounded to 50¢)

→ Minimum fare per journey 1.50€

→ Where to buy
On the bus, ticket machines, südtirolmobil ticket offices. Onboard trains an additional cost of 5€ may be added.

→ Validating
Check in at the start of each journey — either at the train station from which you are departing or directly on the bus. If you have a return ticket, both journeys must be made on the same day and checked in at the start of each journey.

Day ticket for urban buses in the city of Bozen-Bolzano

Valid on the day on which you first activate it.

→ Fares 4€

→ Where to buy
On the bus (on some routes only), ticket machines, südtirolmobil ticket offices.

Important routes

→ Bus N° 111
unibz, Universitätsplatz 1 – Piazza Università, 1
→ NOI Techpark (also Fraunhofer Arena)

More information about routes and fares
suedtirolmobil.info/en

Informations regarding the conference

isiea.events.unibz.it
info.isiea2022@unibz.it

Covid Informations

italia.it/en/covid19
infocovid.viaggiaresicuri.it/en

Travel Restrictions

As of June 1st, a Green Pass equivalent certificate is no longer needed to enter Italy. All Covid-19 related entry restrictions have been lifted. From June 16th, wearing a protective mask is not mandatory except for public transport, both regional and interregional. The use of masks is still suggested in crowded environments.

Important Numbers in South Tyrol

→ Emergency number
112

→ State Police
+39 0471 947611

→ Bozen-Bolzano Hospital (emergency)
+39 0471 908330

WiFi in unibz

→ Network openAiR
→ Password 0128-1940
1. unibz
2. Train Station
3. Bus Station
4. Hotel Figl
5. Stadt Hotel Città
6. Hotel Feichter
7. Hotel Greif
8. Parkhotel Laurin
9. Hotel Scala Stiegl
10. Mareccio Castle
11. Smart Mini Factory
Free University of Bozen-Bolzano
Universitätsplatz 1, Bozen
Piazza Università, 1, Bolzano

Fraunhofer ARENA
Alessandro-Volta-Straße 13A, Bozen
Via Alessandro Volta, 13A, Bolzano

NOI Techpark
Alessandro-Volta-Straße 13A, Bozen
Via Alessandro Volta, 13A, Bolzano

Mareccio Castle
Claudia-de’-Medici-Straße 12, Bozen
Via Claudia de Medici, 12, Bolzano
SMART Mini Factory (SMF Lab)

Antonio-Rosmini-Straße 7, Bozen
Via Antonio Rosmini, 7, Bolzano

Duka AG

Duka Straße 2, Bressanone
(Special bus on the 23\textsuperscript{rd} at 9 am in front of unibz)

Cablecar to Renon

12-minute drive by gondola (one way). Departures in every 4 minutes. Return ticket 10€

Trauttmansdorff

An extraordinary botanical garden located near Meran-Merano. Entrance fee 15€
Ötzi the Iceman

Mummy from the Copper Age, which was preserved in ice for 5300 years. Entrance fee 13 €

Lake of Carezza

Green mountain lake which is known as "Rainbow Lake" and "Fairytale Lake of the Dolomites"

Alto Adige wine road

It is characterised by its unique grapevine landscape fascinating in every season

Verona Arena

Amphitheatre for opera performances. Tickets starting from 32€
SME 4.0 – Industry 4.0 for SMEs
This project has received funding from the European Union’s Horizon 2020 R&I programme under the Marie Skłodowska-Curie grant agreement No 734713

ICARUS – An Innovative Higher Education Institution Training Toolbox to Effectively Address the European Industry 4.0 Skills Gap and Mismatches
Erasmus+ Project No. 2019-1-MT01-KA203-051265

ETAT – Education and Training for Automation 4.0 in Thailand

MASTERMIL – Mastering the Digital Transformation in the Family Business: Getting Ready for the Millennial Generation
unibz grant agreement No WW201N

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Ötzi the Iceman
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Cablecar to Renon
© IDM Südtirol-Alto Adige/Alex Filz

Trauttmansdorf
Reisefu, Unsplash

Lake of Carezza
Enrica Tancioni, Unsplash

Alto Adige wine road
Marcus Ganahl, Unsplash

Verona Arena
Gabriel Castles, Unsplash