Conference proceedings of the final EU conference in Ghent

*September 2019 – M36*

**D7.6, WP 7**

Authors: Università Cattolica del Sacro Cuore – Transcrime (UCSC – Transcrime)

Modelling the PRocesses leading to Organised crime and TerrOrist Networks
FCT-16-2015
### Technical References

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<tr>
<th>Project Acronym</th>
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<tr>
<td>Project Title</td>
<td>Modelling the PRocesses leading to Organised crime and TerrOrist Networks</td>
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</table>
| Project Coordinator | Ernesto Savona  
| | Università Cattolica del Sacro Cuore  
| | ernesto.savona@unicatt.it |
| Project Duration | October 2016 – September 2019 (36 months) |

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1 PU = Public  
PP = Restricted to other programme participants (including the Commission Services)  
RE = Restricted to a group specified by the consortium (including the Commission Services)  
CO = Confidential, only for members of the consortium (including the Commission Services)

### Document history

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Summary

This report gathers all the documents related to the Final Conference held in Ghent (Belgium), on September 18th 2019. It includes the agenda, the list of participants, the presentations and the minutes of the meeting.

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<th>Name</th>
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<td>Giulia Andighetto</td>
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<td>Alberto Azanli</td>
<td>Università Cattolica del Sacro Cuore and Transcrime</td>
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<td>Mario Anna Bencocchi</td>
<td>Municipality of Palermo</td>
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<td>Francesco Calatorti</td>
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<td>Claudio d’Alessio Marascuitti</td>
<td>OEAFT - Observatoire Européen Anti-Mafia et Contre-Terrorisme</td>
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<td>Martina Di Trico</td>
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<td>Vincent Chris Figliomeni</td>
<td>F.F. Social Science Research Center in Calabria</td>
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<td>Eleonora Forte</td>
<td>EUROPOL</td>
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<td>Badi Heshl</td>
<td>Institute of Criminology, The Hebrew University</td>
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<td>Collin Hoogeveen</td>
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<td>Daniel Jaski</td>
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<td>Mario Paolucci</td>
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<td>Luca Pugniere</td>
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<td>Stefan Ritting</td>
<td>Fraunhofer IAS</td>
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<td>Rafael Rondelaz</td>
<td>Police &amp; Customs Cooperation Centre Eindhoven/Tournai</td>
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<tr>
<td>Ernesto Savona</td>
<td>Università Cattolica del Sacro Cuore e di Trasimeno</td>
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<td>Grzegorz Talarski</td>
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<td>Anna Maria da Silva</td>
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2. Agenda

Final Conference
September 18th 2019

Agenda

Ghent

Conference room Auditorium C (Campus Aula – Universiteitstraat =
in the main conference venue).
Co-ordinator
UC3C - Università Cattolica del Sacro Cuore - Transcrime

Co-Coordinator
HIJUI - The Hebrew University of Jerusalem

PRiMaR - Gesellschaft für Prämierung von angewandten Forschung e.V. - IPM
IBMR - IBMR Research GmbH
ITTI - ITTI SF ZOO
CNR - Consiglio Nazionale delle Ricerche - ISTC
VU/LUMC - Stellenbosch UJ
UB - Universitat de Barcelona - CREA
UCAM - The Chancellor, Masters and Scholars of the University of Cambridge
FAU - Friedrich-Alexander Universität Erlangen Nürnberg
USMF - The University System of Maryland Foundation, Inc.
UNIPA - Università degli Studi di Palermo
UNIPV - Università degli Studi di Pavia
YOURIS - YOURIS.COM
MUNIPALEMOS - Municipality of Palermo
Rá - Rotkreuzjugend Ráost
EUCPN - European Crime Prevention Network
EUROPOL - European Police Office
DPPS - Ministero dell'interno
WDDO - United Nations Office on Drugs and Crime (Subcontractor)

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 699824.
Conference Agenda

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<th>Time</th>
<th>Session</th>
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<tr>
<td>09:00 – 09:30</td>
<td>Registration of the participants</td>
</tr>
<tr>
<td>09:30 – 10:00</td>
<td>1st session: Presentation of the results</td>
</tr>
<tr>
<td>09:30 – 10:00</td>
<td>Ernesto Savona (UCSC, Transcrime): Overview of PROTON project and presentation of its final results.</td>
</tr>
<tr>
<td>10:00 – 12:30</td>
<td>2nd session: PROTON-S</td>
</tr>
<tr>
<td>10:00 – 10:30</td>
<td>Francesco Caideroni (UCSC, Transcrime): ABM simulations, structure and policy scenarios of OC</td>
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<tr>
<td>10:30 – 11:00</td>
<td>Badi Hasisi (HIJJ): ABM simulations, structure and policy scenarios of TN</td>
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<tr>
<td>11:00 – 11:15</td>
<td>Coffee Break</td>
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<tr>
<td>11:15 – 11:45</td>
<td>Giulia Andrietto (CNKI): PROTON-S results</td>
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<tr>
<td>11:45 – 12:00</td>
<td>Ernesto Savona (UCSC, Transcrime): Policy Implications OC</td>
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<tr>
<td>12:00 – 12:15</td>
<td>Badi Hasisi (HIJJ): Policy Implications TN</td>
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<tr>
<td>12:15 – 12:30</td>
<td>Q&amp;A</td>
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<td>12:30 – 13:30</td>
<td>Lunch</td>
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<tr>
<td>13:30 – 14:45</td>
<td>3rd session: PROTON WIZARD</td>
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<tr>
<td>13:30 – 14:00</td>
<td>Grzegorz Taborski (ITTI): PROTON-Wizard results and next steps (bc)</td>
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<tr>
<td>14:00 – 14:30</td>
<td>Ernesto Savona (UCSC, Transcrime): Proton Manuals</td>
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<tr>
<td>14:30 – 14:45</td>
<td>Q&amp;A</td>
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<tr>
<td>14:45 – 15:00</td>
<td>Ernesto Savona (UCSC, Transcrime): Closing of the conference</td>
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3. Minutes

Minutes of the Final Conference

September 18th 2019

Conference room Auditorium C (Campus Aula – Universiteitstraat = in the main conference venue).
# List of participants

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<th>Organisation</th>
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<td>Università Cattolica del Sacro Cuore - Transcrime</td>
<td>UCSC TRANSCRIME</td>
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<td>Jay Albanese</td>
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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 699824.
The Final Conference of the project PROTON was held at Ghent University in Conference Room Auditorium C Campus Aula – Universiteitstraat, on the 18th September 2019.

3.1 First Session: Presentation of the results

Ernesto Savona (UCSC-Transcrime) Overview of project PROTON and presentation of its final results:
Ernesto Savona welcomes all the participants thanking them for attending the final PROTON Conference and for their productive activities in relation to Project PROTON.
He introduces the meeting, presents the agenda of the conference and makes an overview of the project, he also presents the results that have been achieved so far.

3.2 Second Session: Proton-S

Francesco Calderoni (UCSC-Transcrime) ABM simulations, structure and policy scenarios of OC:
Francesco Calderoni presents the Agent-Based models. He introduces their structure, their advantages and caveats.
He focuses on the ABM structure of Organised Crime presenting firstly the background, the crime commission process and the set up model of OC simulations.
He finally presents the Policy scenarios based on the two studied environmental contexts (Southern European city, Northern European city) and the two policy interventions (Social, preventive interventions, Network disruption interventions).

Badi Hasisi (HUJI) ABM simulations, structure and policy scenarios of TN:
Badi Hasisi presents the ABM simulations with a focus on the Terrorist Networks. He explains how the structure of the model is and its objectives.
He introduces the three conducted Experiments and the key results.
He concludes his presentation with the related key findings.

Giulia Andrighetto (CNR) PROTON-S results:
Giulia Andrighetto presents the Results of the Simulations of Organised Crime and Terrorist Recruitment models.
She firstly presents the proof of concept results for the OC scenario that have been conducted to test the validity of the OC model, divided in the two contexts with the 4 policy interventions.

She then discusses the completed results for the Terrorist Recruitment Model and the three tested policies: employment, community workers, and community policing.

Ernesto Savona (UCSC-Transcrime) Policy Implications OC:
Ernesto Savona states that after having heard the presentation of Giulia Andrighetto, having read deliverable D5.1 sent on September 15th, where no final results (only proof concept) on the OC ABM
model are presented by CNR at a final conference, as it was expected, he is unable to draw policy implications. Simulations have not been completed by CNR and the four designed interventions completely tested. He hopes that, if simulations will be completed in time by CNR, project PROTON will be able to test the four interventions and discuss their policy implications.

**Badi Hasisi (HUJI) Policy Implications TN:**
Badi Hasisi presents the policy implications based on the results of the ABM simulations. He firstly describes the benefits and limitations of the ABMs and convenes the consequent deductions. He moves to the implementations of the results and concludes with the recommendations.

**Q&A:**
Discussion on the previous presentations follows

### 3.3 Third session: PROTON WIZARD

**Grzegorz Taberski (ITTI): PROTON- Wizard results and next steps**
Grzegorz Taberski gives an overview of the PROTON- Wizard and its overall information. He firstly presents the aim of PROTON Wizards and present data obtained from ABM simulations, in user friendly interface. He explains that two Wizards have been created, namely for OC and TN and that they present data calculated by PROTON-S Simulator. He then shows a demo of the two Wizards.

**Ernesto Savona (UCSC-Transcrime) Proton Manual:**
Ernesto Savona presents the PROTON manual and its main content. He stresses that during the Third Consortium Meeting in Palermo, the consortium had taken the decision to build up a manual for end-users that explains what ABM are and how they work. Proton manuals written in a plain language could be used by new policy makers and practitioners that could follow their guidelines when they want to repeat simulations on OC and TN.

**Q&A:**
Discussion on Proton Manual and its usability follows

**Ernesto Savona (UCSC-Transcrime) Closing of the conference:**
Ernesto Savona wraps up the meeting, thanks the audience for participating in the meeting and asserts that final results will be brought to the European Commission at the Final Review Meeting. He invites the members of the consortium to meet for a business meeting.

### 3.4 Fourth Session: Business Meeting

From 14:15 to 14:45 a Business Meeting among the members of the consortium has been held to take the final decisions before the end of the project.
Ernesto Savona chairs the meeting and introduces the pending issues.

<table>
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<tr>
<th><strong>Issue raised</strong></th>
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<tr>
<td>The coordinator informs the partners that, as they know from previous correspondence, a request for postponement has been requested by CNR on September 12th for not having concluded the simulations on OC on time (copy of the mail below).</td>
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<tr>
<td>Ernesto Savona asks CNR if they will be able to provide the expected results by the end of the month, as agreed in the Grant Agreement.</td>
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<tr>
<td>Giulia Andrighetto informs the partners that, as they know from previous correspondence, a request for postponement has been requested by CNR on September 12th for not having concluded the simulations on OC on time (copy of the mail below).</td>
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<tr>
<td>Giulia Andrighetto also claims that the results obtained by CNR are consistent with what is included in the Grant Agreement. However, since in deliverable 5.1 submitted on September 15th the CNR unit has been able to include only the results of simulations conducted with proof of concept (i.e., more extreme) parameters but not with the more realistic values, the CNR will need additional time to provide the complete set of simulations.</td>
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<tr>
<td>Ernesto Savona replies that what has been presented by CNR at this final conference are not final results, as expected, but only proof of concept, that is a reduced amount of simulations, that has made the complete test of the four designed interventions, the complete input in the wizard, and the consequent policy implications impossible. These are all core parts of project Proton. It is clear at page 61 of deliverable 5.1 (CNR) and at page 7 of deliverable D5.3 (UCSC) that simulations for OC model have not been completed and that there are not final results. It is also clear that CNR should be continuing with simulations in order to achieve the final results. Mr Paolucci (CNR) intervenes to propose a time schedule and a simulation plan to provide the complete set of simulations. He assures that CNR will complete the simulations, as requested, in order to provide input to wizard and test the four policy interventions and consequently allow the coordinator to draw the necessary policy implications.</td>
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Giulia Andrighetto and Mario Paolucci leave the meeting.

Badi Hasisi confirms the availability and hard work that CNR has devoted to the project and that the results of the simulations can be unpredictable.

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<th><strong>Decision taken</strong></th>
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<td>Having heard the declaration of Mr. Paolucci (CNR) in direction of a commitment of CNR in completing the simulations before the final review meeting planned for October 28th 2019, the coordinator decides to explain to the PO the need for a little more flexibility and asks to CNR to provide a complete document where all the necessary simulations will be finalized, input provided to Wizard and policy interventions tested. Considering that after the completion of the simulations partner ITTI and UCSC should act consequently for finalizing the conclusions of the</td>
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This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N° 699824.
The Coordinator closes the business meeting at 14.45.

4. Presentations

Francesco Calderoni (UCSC-Transcrime): ABM simulations, structure and policy scenarios of OC

Overview
- Agent-based models (ABMs)
- The structure of the ABM on organized crime
- The policy scenario tested in the ABMs

Agent-based models
What is an Agent-based Model?

An ABM is a computational simulation that aims at analyzing the macro phenomena emerging from agents that are part of an artificial society. It is a methodological framework widely used in biology, ecology, and in the social sciences.

- In the last 10/15 years, its potential has attracted the attention of social scientists and criminologists.
- Criminologists are increasingly adopting ABMs.
  - Urban Crime (Gifford et al. 2019; Wittenberg et al. 2017)
  - Criminal networks (Durley & Hayya 2018)

Agent-based simulations

Agent-based models

Advantages of ABMs

- Testing the impact of interventions before deployment
- Faster, cheaper than experiments
- No harm to individuals, ethic concerns
- Long-term impact

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N° 699824.
Caveats

- Simulation of complex social process
- Validity and calibration; input data are crucial
- Assumptions
- Coding, computational, financial requirements

The structure of the ABM on OC

Background: the ABM on OC

- Informed by systematic review & innovative studies conducted during the first part of PROTON
- Theoretical framework: differential association, social learning, social embeddedness, social opportunity structure
- Two model setups: Southern European (Palermo) and Northern European (Dutch city)

A multiplex network

- Family
- School
- Professional
- Friendships
- Co-offending
- .... and OC membership
  - 1 OC group, with members embedded in the multiplex network

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N° 699824.
Agents’ individual attributes

- Age
- Sex
- Education
- Income
- Criminal propensity
- OC membership

Crime commission process

Individual attributes

Network-based attributes

\[ C = \text{Probability of committing a crime} \]

At every tick of the model, any agent can commit a crime.

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N° 699824.
Probability to commit a crime (C)

\[ p(\hat{C})_{st} = \left( \phi(\theta_{g,a}) \sum_{i=1}^{\gamma_{s,t}} \right) + \varepsilon \]

- **Age & Gender**: Based on elaborations of empirical data on Palermo
- **Risk factors**: Based on systematic reviews
- **Error**: Ensuring that total crimes by agents within an age/gender class stay within population averages

---

**Co-Offending**

Co-offenders are matched based on social proximity and probability to commit crime (C)

If the initiation of a co-offense is an OC-agent, selection of co-offenders includes also another factor.

*Organized Crime Embeddedness, R*

---

**OC Embeddedness (R)**

OC is embedded in the social environment and relies on social relations (Tanni 1972, Kleemans & van de Bunt 1999, Kleemans & de Poort 2008)

R proxies how much an agent is in an OC-prone social environment

In summary, for each agent, it is the ratio of OC members out of total agents in the agent’s network

---

**Recruitment into OC**

- **Recruitment**: co-offending between at least one OC-agent and at least one non-OC agent
- The non-OC agent is recruited

---

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N° 699824.
Setup of the OC simulations
- Agents: 1000-10000
- OC members 5-30
- 1 tick = 1 month
- Running time = 20-40 years
- Total crimes = rate 20,000/24,000 per 100k
- Law enforcement = arrest & detention → removal from network
- Networks topology, relations, attributes & crime commission empirically based/inspired

Assumptions
- Crime commission is driven by age, gender, and specific individual and relational attributes
- Co-offending is driven by social relations
- Recruitment into OC is driven by co-offending with OC members
- Recruitment is also driven by how much an individual is embedded in OC prone relations

Policy scenarios

The scenarios tested in PROTON ABMs on OC
- Two possible environmental contexts:
  - Southern European city (Palermo)
  - Northern European city (Eindhoven)
- Two types of policy interventions:
  - Social, preventive interventions
  - Network disruption interventions

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N° 699824.
The social prevention interventions

Addressing minors at risk of recruitment into OC

Primary socialisation option

- Based on policy currently applied at the Juvenile Court of Reggio Calabria
- Nearly 50 cases of juveniles removed from father’s influence
- Agreement and participation of the mother
- Always upon court order and in the interest of the children.

The social prevention interventions

Primary socialisation option in the ABM on OC

- Target: children of OC members (e.g., father OC member), aged 12-19
- Effects:
  - Removal of links to the father (mirroring removal of the father’s parental authority)
  - Limitation of contacts with family members who are OC members
  - Psychological, welfare and educational support to the children and the mothers (higher employability for the mother and higher educational attainment for the children)

The social prevention scenario

Secondary socialisation

- Based on several policy interventions addressing children at risk, e.g.:
  - School openings during afternoons and holidays
  - Social, educational and sport activities in difficult neighbourhoods

The social prevention interventions

Secondary socialisation option in the ABM on OC

- Target: school age children (6-18) at risk (several options based on OC-embeddedness score or probability of committing crimes)
- Effects:
  - Better educational support (spent will complete school and/or achieve a higher degree)
  - Support of psychologists & social workers (random creation of friendship ties with non-deviant peers and adults)
  - Employment opportunities (children offered a job when turning 16-18, resulting in a diversification of their social networks)

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N° 699824.
The network disruption scenario

Modifies the allocation of resources by the law enforcement action in the ABM (i.e. change probability of arrest), while keeping total law enforcement resources constant.

Top ranks targeting
- Based on growing literature and operational debates on network disruption.
- Evidence that targeting more central individuals yields higher disruption.

The network disruption scenario

Targeting OC leaders
- Targets: OC bosses/lieutenants (selected by centrality in the multiplex network)
- Effects:
  - OC bosses/lieutenants more likely to be arrested (removed from the network)
  - Harder recruitment process (if most central OC members are missing, co-offending with non-OC becomes harder)

The network disruption scenario

Targeting facilitators
- Based on discussion during the meeting in Amsterdam and evidence on the importance of specific professional skills for OC
- Some crimes in the simulations require a facilitator (e.g. an accountant, lawyer, customs officer, truck driver, chemist)
- Some agents in the network are facilitators and are required to commit crimes with more than 1 offender

The network disruption scenario

Facilitator targeting in the ABM on OC
- Targeting: all facilitators
- Effects:
  - Facilitators more likely to be arrested when they commit any crime (removed from the network)
  - Harder recruitment process (the commission of more complex crimes becomes harder)

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N° 699824.
Conference proceedings of the final EU conference in Ghent

**C function**

\[ p(C) = \left( \prod_{i=1}^{n} \left( \frac{\gamma_i}{\gamma_{i+1}} \right) \right) + \epsilon \]

- **Age & Gender** based on elaborations of empirical data on Palermo
- **Risk factors** based on systematic reviews
- **Error** ensuring that total crimes by agents within an age & gender class stays within population averages

**Crime commission process**

<table>
<thead>
<tr>
<th>Sex, Age (years)</th>
<th>Probability (安全管理)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Females, 12-14</td>
<td>0.120</td>
</tr>
<tr>
<td>Females, 15-17</td>
<td>0.092</td>
</tr>
<tr>
<td>Females, 18-20</td>
<td>0.070</td>
</tr>
<tr>
<td>Females, 21-24</td>
<td>0.050</td>
</tr>
<tr>
<td>Females, 25-29</td>
<td>0.030</td>
</tr>
<tr>
<td>Females, 30-34</td>
<td>0.010</td>
</tr>
<tr>
<td>Females, 35-39</td>
<td>0.001</td>
</tr>
<tr>
<td>Females, 40-44</td>
<td>0.001</td>
</tr>
<tr>
<td>Females, 45-49</td>
<td>0.001</td>
</tr>
<tr>
<td>Females, 50-54</td>
<td>0.001</td>
</tr>
<tr>
<td>Females, 55-59</td>
<td>0.001</td>
</tr>
<tr>
<td>Females, 60-64</td>
<td>0.001</td>
</tr>
<tr>
<td>Females, 65-69</td>
<td>0.001</td>
</tr>
<tr>
<td>Females, 70-74</td>
<td>0.001</td>
</tr>
<tr>
<td>Females, 75-79</td>
<td>0.001</td>
</tr>
<tr>
<td>Females, 80-84</td>
<td>0.001</td>
</tr>
<tr>
<td>Females, 85+</td>
<td>0.001</td>
</tr>
</tbody>
</table>

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No. 699824.
Crime commission process

Table 5: Individual-level Factors (I) Driving the Crime Commission Process

<table>
<thead>
<tr>
<th>Factor</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Education</td>
<td>Variables falling in high school</td>
</tr>
<tr>
<td>Material Parent</td>
<td>Having a crime propensity higher if a parent has a material parent.</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>Having a crime propensity higher if the individual has an ethnic background.</td>
</tr>
<tr>
<td>Residential Neighborhood</td>
<td>Having a crime propensity higher if the individual has a residential.</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>Having a crime propensity higher if the individual has an ethnic background.</td>
</tr>
<tr>
<td>Neighborhood</td>
<td>Having a crime propensity higher if the individual has a neighborhood.</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>Having a crime propensity higher if the individual has an ethnic background.</td>
</tr>
<tr>
<td>Residential Neighborhood</td>
<td>Having a crime propensity higher if the individual has a residential.</td>
</tr>
<tr>
<td>Occupation</td>
<td>Having a crime propensity higher if the individual has an occupation.</td>
</tr>
<tr>
<td>Educational</td>
<td>Having a crime propensity higher if the individual has an educational.</td>
</tr>
<tr>
<td>Income</td>
<td>Having a crime propensity higher if the individual has an income.</td>
</tr>
</tbody>
</table>

OC Embeddedness

\[ R_t = \frac{\sum_{i=1}^{N} \omega_{i,j}}{\sum_{i=1}^{N} \omega_{i,j}} \in [0,1] \]

Badi Hasisi (HUJI) ABM simulations, structure and policy scenarios of TN
**Objectives of the ABM**

- The ABM seeks to analyze:
  - The **extent** of radicalization and recruitment in the simulated population.
  - Fluctuations in key opinion-related risk-protective factors
  - The effects of key opinion-related risk-protective factors on radicalization and recruitment
  - The effects of **key policy interventions** on the primary and secondary outcomes of interest.

**Structure of the model**

- The model includes:
  - A 2D landscape
  - 4 adjacent but individual neighborhoods with their own characteristics
  - Residences, places of employment, other places (e.g. parks, cafes, community centers)
  - Citizen agents, risk promoting agents, protective promoting agents, police agents, recruiter agents
  - Time: Each step of the model = 1 hour

---

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 699824.
Structure of the model

- Citizen agents:
  1. An innate propensity score and a dynamic risk score.
  2. A place of residence
  3. A place of employment (for employed agents)
  4. Routine activities include the development of preferences for certain places
  5. Differential associations include the development of preference for certain 'people'

- Special agents:
  - Fixed opinions
  - Can broadcast to multiple agents
  - Have more rigid routine activities
    - Community workers
      - Studied at community centers
    - Police
      - Force interactions, engage in patrols
    - Risk promoters,
      - Sound of who people
    - Recruiters
      - Sense and seek out high-risk individuals

Mechanisms of the ABM

The ABM operates by theoretically driven mechanisms:

1. **Routine activities**: "generalized patterns of social activities in a society (i.e., spatial and temporal patterns in family, work, and leisure activities)" (Wikström, 2009:1).

2. **Differential associations**: "individuals with whom a person associates, and who supply definitions both favorable and unfavorable to deviant behavior" (Freiburger & Crane, 2008).

- Changes in opinion-based factors (e.g. trust) are a function of differential associations (Walters, 2015).

- Routine activities and differential associations condition each other (Bernburg & Thorlindsson, 2001; Laub & Sampson, 2009).

How the ABM works

- Agents traverse the model, carry out routine activities, come into contact with other agents, and engage in interactions.

- Interactions operate according to opinion-dynamics and can change values of opinion-related risk-protective factors.

- At each tick of the model, risk scores are updated, reflecting the outcomes of interactions.

- Agents above the threshold for 'high-risk' (top 5.6% of scores) are susceptible to recruitment.

- Recruiters sense and seek out susceptible agents

- After continued and sustained interactions between recruiters and high-risk-agents, recruitment can occur.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 699824.
Model dynamics
- Propensity and risk score formulation
- Risk score updates at each step of the model

Opinion dynamics

Populating agents
- The population reflects Neukölln, Berlin:
  - A prototypical borough of a major European city in terms of makeup and risk (Husbands, 2002);
  - Current policies exemplify those of other cities; usually implemented at the borough level (Barczyk, 2013).
- Socio-demographic characteristics (age, gender, employment, criminal history, place of residence) based on census data (Berlin Statistics for Neukölln).
- After population, agents’ characteristics were matched with opinion-related risk-protective factor values derived from the European Values Survey (2008) for Germany; Authoritarianism, integration, trust/legitimacy, subjective deprivation.
- Effect sizes were derived from PROTON studies and other empirical sources.

Data sources

<table>
<thead>
<tr>
<th>Variable</th>
<th>Data source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual-level factors</td>
<td>Berliner-Brandenburg (2017)</td>
</tr>
<tr>
<td>Socio-Demographic data</td>
<td>Census (2017)</td>
</tr>
<tr>
<td>Criminal history</td>
<td>European Values Study (2006)</td>
</tr>
<tr>
<td>Opinions-related psychological factors</td>
<td>T2.1</td>
</tr>
<tr>
<td>Weight for individual-level factors</td>
<td>City of Berlin (2017)</td>
</tr>
<tr>
<td>Environmental factors</td>
<td>City of Berlin (2017)</td>
</tr>
<tr>
<td>Size and density of neighborhoods</td>
<td>City of Berlin (2017)</td>
</tr>
<tr>
<td>Number of police</td>
<td>Europea Values Study (2006)</td>
</tr>
<tr>
<td>Proportion of incidented individuals</td>
<td>City of Berlin (2017)</td>
</tr>
<tr>
<td>Number of targeted individuals</td>
<td>City of Berlin (2017)</td>
</tr>
<tr>
<td>Proportion of protected places</td>
<td>Google Earth (2015)</td>
</tr>
<tr>
<td>Characteristics of risky places</td>
<td>Becker (2014)</td>
</tr>
<tr>
<td>Number of police</td>
<td>City of Berlin (2017)</td>
</tr>
<tr>
<td>Experimental factors</td>
<td>Global Web Index, 2018</td>
</tr>
<tr>
<td>Weight of online communication</td>
<td>T2.1</td>
</tr>
<tr>
<td>Recruitment type</td>
<td>Banjewski et al. (2013)</td>
</tr>
<tr>
<td>Police-citizen encounters</td>
<td>Kropf &amp; Pichler (2013)</td>
</tr>
<tr>
<td>Proportion of negative encounters</td>
<td>Zammutt (2015)</td>
</tr>
<tr>
<td>Weight of negative police encounters</td>
<td>T2.1</td>
</tr>
<tr>
<td>Absolute positive police encounters</td>
<td>OIL et al. (2015)</td>
</tr>
</tbody>
</table>

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N° 699824.
Selection of experiments

- Based on the results of WP2, meetings with consortium partners, and consultations with policy makers.
- Experiments were designed to target multiple mechanisms and factors simultaneously and to:
  - Have a direct effect on one or both of the model’s mechanisms (Routine activities and differential associations), and an indirect effect on the non-targeted mechanism;
  - Directly target specific dynamic risk factors (e.g. integration and trust), and have an indirect effect on the non-targeted risk factors.

Experiment 1: Targeted employment

The policy experiment seeks to increase the percentage of employment among unemployed, specifically those considered high risk. For example, government provides incentives for hiring high risk individuals

- Employment has a direct effect on propensity and thereby risk as well;
- Employment has a direct effect on relative deprivation (dynamic factor);
- Employment has a direct effect on routine activities and thereby conditions differential associations and limits free time.

H1: Lower levels of unemployment reduce the risk of radicalization and recruitment

Experiment #2: Community workers

The policy experiment seeks to increase the number of community workers in the environment. For example, the city expands programming at community centers, hiring new workers who promote integration and trust.

- Community workers have a direct effect on all three dynamic factors.
- Community workers have a direct effect on differential associations and thereby routine activities
- Community workers have an indirect effect agent selection of places to visit.

H2: More community workers will reduce the risk of radicalization and recruitment

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Experiment #3: Community policing

The policy experiment seeks to change the role and effect of police officers in the community, reducing the number of negative police-citizen interactions, promote integration and trust and reduce feelings of relative deprivation. For example, the city decides to create a special unit of officers dedicated to community policing:

- Community police officers have a direct effect on all three dynamic factors;
- Community police officers have a direct effect on different associations and thereby routine activities;
- Community police officers have an indirect effect agent selection of places to visit.

H3: Community police officers will reduce the risk of radicalization and recruitment.

Analytic approach

- Base model:
  - 40 runs
  - Average scores across all runs
- Experimental conditions:
  - 40 runs
  - Average scores across all runs
- Parametric and non-parametric comparison of means across all runs.

Results

<table>
<thead>
<tr>
<th>Factor</th>
<th>Base model</th>
<th>Employment</th>
<th>Community workers</th>
<th>Community police</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruitment</td>
<td>77.20 (8.42)</td>
<td>26.2 (5.82)***</td>
<td>79.88 (8.23)</td>
<td>78.38 (7.36)</td>
</tr>
<tr>
<td>Radicalization</td>
<td>0.51 (0.01)</td>
<td>0.51 (0.01)</td>
<td>0.47 (0.01)***</td>
<td>0.50 (0.01)</td>
</tr>
<tr>
<td>Integration</td>
<td>-0.11 (0.01)</td>
<td>-0.11 (0.01)</td>
<td>-0.16 (0.01)***</td>
<td>-0.11 (0.01)</td>
</tr>
<tr>
<td>Deprivation</td>
<td>0.34 (0.01)</td>
<td>0.33 (0.01)</td>
<td>0.23 (0.02)***</td>
<td>0.34 (0.01)</td>
</tr>
<tr>
<td>Trust</td>
<td>-0.59 (0.01)</td>
<td>-0.59 (0.01)</td>
<td>-0.68 (0.01)***</td>
<td>-0.62 (0.01)***</td>
</tr>
</tbody>
</table>

***p<0.001. All tests were conducted using both parametric and non-parametric methods. All comparisons are made with the base model.
### Results

<table>
<thead>
<tr>
<th>Factor</th>
<th>Employment</th>
<th>Community workers</th>
<th>Community police</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruitment</td>
<td>&lt;66.06%</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Radicalization</td>
<td>-</td>
<td>&lt;7.8%</td>
<td>-</td>
</tr>
<tr>
<td>Integration</td>
<td>-</td>
<td>&gt;42.11%</td>
<td>-</td>
</tr>
<tr>
<td>Deprivation</td>
<td>-</td>
<td>&lt;32.35%</td>
<td>-</td>
</tr>
<tr>
<td>Trust</td>
<td>-</td>
<td>&gt;12.25%</td>
<td>&gt;5.08%</td>
</tr>
</tbody>
</table>

### Key findings

- Changes to routine activities are affected by employment, which affects recruitment but not other outcomes.
  - Prior research has found that the inverse relationship between employment and crime is a function of routine activities (Apel & Horney, 2017).
  - Employed individuals have less 'free time' with which to meet radicalizing influences and recruiters (Simi & Windisch, 2018).

### Key findings

- Changes to differential associations affects radicalization via changes to opinion-based risk-protective factors; but no spillover effect to recruitment.
  - The risk factor-radicalization-recruitment model remains a theoretical one (Stern, 2016).
  - Although statistically the theoretical model makes sense, more time may be needed to observe spillover effects.
  - Improvements in secondary outcomes of interest are nevertheless desirable and positive.
Giulia Andrighetto (CNR): PROTON-S results

RESULTS OF THE SIMULATIONS OF ORGANISED CRIME AND TERRORIST RECRUITMENT MODELS
Giulia Andrighetto & Mario Peducci
PROTON Final Conference
Ghent, September 18th 2019

Organised Crime Recruitment Model

How does the number of OCN members differ relative to the four policies i) targeting OC leaders, ii) facilitators, iii) primary socialization, and iv) secondary socialization?

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N° 699824.
OC Simulations Setting: Proof of concept

Number of Agents 3000
Number of Org Criminals 30 (S) 15 (N)
Number of Incarcerations per year 300 (S) 150 (N)

Time units 360 (30 synthetic years)
Number of Replications +25
Computing time per simulation between 6 and 22 hours per simulation
5340 hours (222 days) in total

COMBINATIONS

- 4 policy interventions (OC leaders, facilitators, primary socialization, and secondary socialization).
- 2 contexts: Northern and Southern European areas.
- Total of 10 combinations.

Results: Southern European Scenario

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 699824.
Effect of **TARGETING OC LEADERS**

![Graph showing effect of targeting OC leaders.](image)

Significant differences are displayed in green and non-significant differences are displayed in red.

Effect of **TARGETING FACILITATORS**

![Graph showing effect of targeting facilitators.](image)

Significant differences are displayed in green and non-significant differences are displayed in red.

Effect of **TARGETING PRIMARY SOCIALIZATION**

![Graph showing effect of targeting primary socialization.](image)

Significant differences are displayed in green and non-significant differences are displayed in red.

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N° 699824.
Effect of TARGETING SECONDARY SOCIALIZATION

Results: Northern European Scenario

OC Simulations Setting: Proof of concept

- Number of Agents: 3000
- Number of Org Criminals: 30 (S) 15 (N)
- Number of Incarcerations per year: 300 (S) 150 (E)
- Time units: 360
- Number of Replications: +25
- Computing time per simulation: between 6 and 22 hours, per simulation 5240 hours in total

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N° 699824.
Effect of TARGETING OC LEADERS

Significant differences are displayed in green and non-significant differences are displayed in red.

Effect of TARGETING FACILITATORS

Significant differences are displayed in green and non-significant differences are displayed in red.

Effect of TARGETING PRIMARY SOCIALIZATION

Significant differences are displayed in green and non-significant differences are displayed in red.

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N° 699824.
Effect of TARGETING SECONDARY SOCIALIZATION

Summary

- Results of the simulations yield realistic outcomes:
  - Number of OC members (remains in the range of 15-35 members) SEC/ remains in the range of 15-20 members NEC).
  - Number of crimes (stable across different runs and with a slowly declining trend across time).

- Southern European context: facilitators and primary socialization interventions have an effect on the number of recruited individuals, no effect in the interventions targeting OC leaders and secondary socialization.

- Northern European context: the only intervention reporting a statistically significant effect is the one targeting facilitators; but some suggestions that secondary socialisation may have an effect.

Terrorist Recruitment Model

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 699824.
What is the effect of three policies, namely i) employment, ii) community workers, and iii) community policing, on radicalization, recruitment, and three opinion-based risk-protective factors?

### TM parameters and simulation settings

<table>
<thead>
<tr>
<th>Variable</th>
<th>Value</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of communities</td>
<td>( \lceil n^2 \cdot (n \in N_{&gt;0}) \cdot (n^2 \mod 2 = 0) \rceil )</td>
<td>36</td>
</tr>
<tr>
<td>Community side length</td>
<td>( N_{&gt;0} )</td>
<td>30</td>
</tr>
<tr>
<td>Citizens per community</td>
<td>( N_{&gt;0} )</td>
<td>10,000</td>
</tr>
<tr>
<td>Activity radius</td>
<td>( N_{&gt;0} )</td>
<td></td>
</tr>
<tr>
<td>Tolerance (Alpha)</td>
<td>([0,1])</td>
<td></td>
</tr>
<tr>
<td>Shape (Places)</td>
<td>String</td>
<td></td>
</tr>
<tr>
<td># of agents</td>
<td>40,000</td>
<td>40,000</td>
</tr>
<tr>
<td>Tick</td>
<td>1 hour</td>
<td>3060 (5 simulated months)</td>
</tr>
<tr>
<td>Replications</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>Computation time</td>
<td>8 days per simulation 1280 hours (61 days) in total</td>
<td></td>
</tr>
</tbody>
</table>
COMBINATIONS

1 baseline, 3 policy interventions (employment, community workers, community policing), a set of sensitivity analyses.

Effect of Employment

Employment effect with different dosage

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N° 699824.
Effect of **COMMUNITY WORKERS**

![Graphs showing the effect of community workers on various metrics]

Effect of **COMMUNITY POLICING**

![Graphs showing the effect of community policing on various metrics]

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 699824.
Summary

- Model shows internal and external validity:
  - Levels of radicalization remaining quite stable;
  - Levels of recruitment growing in a relatively linear fashion over the period and falling within the predicted range.
- Employment initiative: significant effect on recruitment (but no on radicalization or on any of the opinion-related risk-protective factors)
- Community workers’ initiative significant effect on i) radicalization, ii) all three opinion related factors
- Community policing initiative significant effect only on improving trust/legitimacy

Thank you for your attention

Badi Hasisi (HUJI): Policy Implications TN

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 699824.
Benefits & limitations of ABM

Benefits:
- Enables simulation of policies that are:
  - difficult to evaluate in the real world;
  - expensive and ethically challenging to carry out randomized controlled trials;
- Predicts actual values of outcomes beyond what is known
- Models complexities that traditional statistical models cannot handle

Limitations:
- While there are many advantages to ABM, they do not replace field experiments
- These are still only models
- Models are built on assumptions

Generalizability

- Results from ABM’s at the borough level can be up-scaled to larger populations (Weisburd et al., 2017).
- Community workers initiatives in Europe are usually conducted at the borough level (Christmann, 2012; Ranstorp & Hyllengren, 2013).
- Community policing in the EU usually operates at the borough level (e.g. van Swaanningen, 2008; Fitzgerald, Joseph, Qureshi, & Hough, 2013).
### Review of results

<table>
<thead>
<tr>
<th>Factor</th>
<th>Base model</th>
<th>Employment</th>
<th>Community workers</th>
<th>Community police</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruitment</td>
<td>77.20 (8.42)</td>
<td>26.2 (3.82)**</td>
<td>79.88 (8.23)</td>
<td>78.38 (7.30)</td>
</tr>
<tr>
<td>Radicalization</td>
<td>0.51 (0.01)</td>
<td>0.51 (0.01)</td>
<td>0.47 (0.01)**</td>
<td>0.50 (0.01)</td>
</tr>
<tr>
<td>Integration</td>
<td>-0.11 (0.01)</td>
<td>-0.11 (0.01)</td>
<td>-0.19 (0.01)**</td>
<td>-0.11 (0.01)</td>
</tr>
<tr>
<td>Deprivation</td>
<td>0.34 (0.01)</td>
<td>0.33 (0.01)</td>
<td>0.23 (0.02)**</td>
<td>0.34 (0.01)</td>
</tr>
<tr>
<td>Trust</td>
<td>-0.59 (0.01)</td>
<td>-0.59 (0.01)</td>
<td>-0.68 (0.01)**</td>
<td>-0.62 (0.01)**</td>
</tr>
</tbody>
</table>

### Primary deductions

- Changes to dynamic risk factors can have a spillover effect to radicalization;
  - However, this does not necessarily spill-over onto recruitment; at least not in the short term.
- Changes to routine activities can have more immediate effects on recruitment;
  - However, they do not have an effect on dynamic risk factors or radicalization; at least not in the short term.

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This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N° 699824.
Why routine activities matter

- There is a steady supply of potential criminals ('recruits').
- Changes to routine activities affect the opportunities for engagement with deviant elements, reducing the likelihood of criminal involvement (Osgood et al., 1996; Haynie and Osgood, 2005; Apel & Horney, 2017).
- Employment is a key element of differential routine activities that affects the likelihood of criminal involvement (Apel & Horney, 2017).
- Routine activities, which are conditioned by factors such as employment, can explain differential outcomes for radicalization, recruitment, and desistance from terrorism as well (Simi & Windisch, 2018; Windisch, Simi, Ligan and McNeel, 2016).

Multi-faceted approach

- Most western countries already
  - Take a multi-faceted approach;
  - Engage in the types of policies modelled.
- The question in about implementation, and addressing objectives and expectations
  - Short term and long term effects and expectations;
  - Identifying and specifying primary and secondary outcomes of interest.
  - Successes in secondary outcomes of interest (e.g. improving integration) are desirable even if there is no immediate spill-over effect onto primary outcomes of interest (e.g. recruitment).

Identifying specific strengths

- Why did community workers affect risk factors and radicalization but not recruitment?
  - Community workers may be highly effective;
  - However, they may not come into contact with high-risk individuals naturally (Hirschfield et al., 2012).
Identifying specific strengths

Why did community police officers affect trust/legitimacy but this had no impact on radicalization and recruitment?

- The purpose of increasing trust/legitimacy is to increase willingness to cooperate (Jackson, Huq, Bradford and Tyler, 2013; Tyler, Schulhofer and Huq, 2010; Hasl & Welshburg, 2014).
- Increased willingness to cooperate is meant to assist police in identifying high-risk individuals (Huq, Tyler and Schulhofer, 2011).

Identifying specific strengths

Why did employment affect recruitment but not risk factors or radicalization?

- The purpose of employment is to reduce the opportunities for unstructured activities, and thereby the available time for contact with radicalizing or deviant influences.
- Prevention of recruitment/involvement may be easier to achieve that de-radicalization, which may be more long term (Horgan, 2008; LaFrance & Miller, 2008).
- Career/employment may be one of the best ways to steer radicals away from involvement, even without changing their beliefs (Alber et al., 2014).

Implementation

Employment:

- Requires identification of high-risk;
- Results from WP2 may improve risk assessment
- Requires creative incentivization;
- Employers, prospective employees

Community workers:

- Requires training;
- Encouraging uptake of services

Community police:

- Requires training;
- Avoiding known pitfalls
- Choosing correct approach

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 699824.
An integrated approach

1. Community police identify high risk individuals
2. Community police refer high risk individuals to community workers
3. Community workers refer high risk individuals to services and employment
4. High risk individuals take up employment
5. Radical risk of recruitment

Community police: Identify high-risk individuals for referral to community workers
Community workers provide referred high risk individuals with services, including employment.
Employment to be taken up by referred high risk individuals via community workers.

Conclusions

Reductions in radicalization, and improvements in factors such as integration and trust are desirable outcomes; even if they have no immediate spill-over effect on recruitment.
An integrative approach should capitalize on specific strengths of different stakeholders and mechanisms.
We do not suggest that this is the only, or even the best way to integrate different approaches.
Simultaneous implementation could be beneficial for both short and long term implementations.
Low risk of stigmatization (offering more treatment, not more punishment...)
Future analyses are still needed (“welfare approach”, need of balance approach...).

Grzegorz Taberski (ITTI) : PROTON- Wizard results and next steps

PROTON WIZARDS

Grzegorz Taberski [ITTI]

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement No 699824.
**PROTON Wizards – overall information**

- Aim of PROTON Wizards is to present data obtained from ABM simulations, in a user-friendly interface.
- There are 2 separate Wizards, one for Terrorist Networks and second for Organized Crime.
- Wizards present data calculated by PROTON-S Simulator (provided as CSV files).

**PROTON Wizard functional flow**

![Diagram of PROTON Wizard functional flow]

**PROTON Wizard for Terrorist Networks**

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This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N° 699824.
PROTON TN Data used for visualisation

Dataset choosing

PROTON TN Wizard home screen

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Conference proceedings of the final EU conference in Ghent

PROTON TN Wizard choosing experiment results

PROTON Wizard for Terrorist Networks Chart section

Two parts: People and Opinions

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TN Wizard - fullscreen chart

User can display chart in fullscreen mode by clicking here.

TN Wizard - fullscreen chart

User can display chart in fullscreen mode by clicking here.

TN Wizard - fullscreen chart

User can display chart in fullscreen mode by clicking here.

This project has received funding from the European Union’s Horizon 2020 research and innovation programme under grant agreement N° 699824.
People – Risk of radicalisation

The chart and table is displayed on the basis of selected parameters.

Opinions

The second part is the Opinions.

- Mean, median and standard deviation choosing
- Baseline and intervention scenario display
- Both scenarios can be displayed separately or combined with others
- Overall or particular neighborhood

PROTON TN Results view

Type of chosen intervention is displayed on top bar.

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PROTON Wizard for Organised Crime

PROTON OC Data used for visualisation

This is a short overview of the data used for visualisation.

PROTON Wizard for Organised Crime

Dataset choosing

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Conference proceedings of the final EU conference in Ghent

PROTON OC Wizard home screen

PROTON OC Wizard Step 1 and 2

PROTON OC Wizard Step 3

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Two parts: Number of people and Distribution

Screen is divided into two parts: People and Opinions

PROTON OC Charts – Number of people

The first part is the concerning recruited people. It contains:
- Table presenting numeric data
- Chart showing how data changes with steps

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PROTON OC Charts – Distribution in each

The second part is the Distribution of selected factors. User can choose between showing it in each step or over time. First option displays how data is distributed in selected step.

PROTON OC Charts – Distribution over time

Distribution over time presents how selected parameter is changing in the selected time period.

Conclusions
Conclusions

- Possibility to select the most appropriate dataset
- Friendly-presentation of complex datasets
- In-place help and glossaries

THANK YOU

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Ernesto Savona (UCSC-Transcrime): Proton Manuals

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Thank you for your attention!