

public transport systems and may serve as a feeder system. We combine large neighborhood search with agent-based modelling and simulation to generate transport schedules (according to objectives such as minimizing carbon emissions) for microtransit services and validate them in terms of vulnerability to delays of passengers or vehicles, and acceptance rates of ad-hoc requests. Passengers, vehicles, and elements of the transport network (stops) are modelled as agents. We study how disturbances, such as delayed services or tardiness of passengers, affect the stability of a transport schedule with respect to transfers at stops and the limited passenger capacities of the vehicles.

3 - Optimization techniques in waste quantity predictions *Veronika Smejkalová*

Estimates of future municipal waste production will enable more efficient infrastructure development (processing, collection network, transport). As variables that can reliably explain the amount of waste are not known for the future, and their predictions are complex, time series modelling is usually used. Historical waste data include considerable variability and several errors. However, optimization methods can refine waste quantity estimates when certain binding constraints are employed. This paper outlines the possibilities of such modelling, where the relationships between individual types of waste will be defined together with territorial and aggregated hierarchical equations. Approaches based on mathematical programming made it possible to cleanse historical data and estimate future production of individual types of waste.

■ TC-37

Tuesday, 12:30-14:00 - Virtual Room 37

Ethics, health, medicine and food

Stream: Ethics in OR
Invited session

Chair: *R Kazakov*

1 - The impact of External Reference Pricing on the health care system: a hybrid simulation exploration of equitable drug access, affordability and availability *R Kazakov, Susan Howick, Alec Morton*

External reference pricing (ERP) regulation and its effects on equitable drug access, affordability and availability in the EU are explored using a hybrid scenario simulator. Two main counteracting behaviors are highlighted: one is connected to the goal of drug price regulators in using ERP to control medicine prices, while the other is connected to the drug suppliers counter behaviour to exploit or avoid the price regulation rules. This tactical game could result in undermining key health care objectives to provide equitable and affordable drug therapies to patients due to drug market entry delays, drug market exits or propagation of excessive drug pricing. The authors have developed a hybrid agent based and system dynamics scenario simulator to explore the effects of the ERP regulation. The construction of the hybrid simulation model was supported by the use of Resource Agent Maps, a novel qualitative modelling technique designed to analyse the interactive behaviour of agents and resources in a complex adaptive systems environment. The simulation results demonstrate that the intention of the ERP regulation to provide affordable medicine prices results in the counter effect of drugs overpricing or drugs unavailability. This brings forward to health care public agenda the question of how to maintain a balance between affordability and availability, and the challenge how to improve drug pricing regulation, in order to resolve this ethical problem and achieve balance.

2 - Interventions on the French wheat-to-bread food value chain and their effects on equitable value distribution: insights from a policy scenario simulator

Seán McGarraghy, Rossen Kazakov, Elise.huber@iddri.org, Elise.huber@iddri.org, William Loveluck, Mircea Gherasim, Cosmin Ailaoie, Pierremarie.aubert@iddri.org, Pierremarie.aubert@iddri.org

This paper reports on the problem of procedural and distributional fairness along the French wheat-to-bread food value chain and the specific hybrid approach of qualitative and quantitative modelling and simulation which was undertaken to address the above issue from the perspective of socioeconomic sustainability of the supply chain system. The paper illustrates how techniques like cognitive mapping and agent resource mapping are used for system analysis, resource flows and agent rules definition. Secondly, we explore how these maps are transferred into a policy scenario simulator for policy experimentation and optional recommendations. This work is part of an EU-funded project focused on understanding European food value chains. Food value chain systems are viewed as complex adaptive systems emerging out of market agents' interactions, resource flows and market price setting. The goal of this hybrid agent modelling approach is to experiment and test various what-if policy and market interventions and to inform the development of transition pathways towards more environmentally sustainable and socially fair food value chains. This paper and the proposed scenario simulator include insights about food value chain actors' behaviour, the factors that influence actors' decisions connected to changes in supply and demand, the interactions among themselves and with the environment, and the factors influencing fair interrelations and fair value distribution.

3 - Simulation exploration of the North Italian tomato food value chain from the perspective of equitable relations and value distribution among market actors

Gianandrea Esposito, Rossen Kazakov, Antonella Samoggia, Seán McGarraghy

Food value chain systems are viewed as complex adaptive systems emerging out of market agents' interactions and market price regulation; Managing such systems is explored through the stages of mapping their behaviour and then simulation of intervention scenarios. This work is part of an EU-funded project on understanding food value chains. We report on initial work on developing a qualitative food system model of the North Italian region tomato value chain market, applying a complex adaptive systems perspective. The paper focusses on the problem of fairness related to price setting and price distribution, and illustrates how techniques like cognitive mapping and agent behaviour mapping are used for system analysis and agent rules definition. The goal of this qualitative agent modelling approach is to support the conceptual, functional and technical specification for the quantitative modelling phase. This paper explores further how a value chain actor (agent) will behave in practice, what actors are there in a particular value chain, what influences their decisions (prices, regulations, etc), what are their interactions among themselves and with the environment, what are the factors influencing fair interrelations and fair value distribution, what are possible scenarios for public policy interventions in regards to improving the system from a more sustainable and ethical perspective? Included are preliminary results, considering simulation potential and limitations.

4 - IMPACT OF ETHICAL BUSINESS PRACTICES ON ORGANISATIONAL COMPETITIVENESS - A Study on Service Sector in India

Rohit Kanda, Harish Handa, Pushpkant Shakdwipee, Jasveen Kaur, Gunmala Suri, G. S. Bhalla, Savita Gautam, Narendra Dashora

The Dissertation held from above study is that Regions with lesser Development in General, in terms of Business, Infrastructure and Economic Development and Lower or Negligible Development in Particular, in terms of Service Sector have more Significance in Existence of Ethical Business Practices, as well as have a Strong Belief that Ethical Business Practices have Positive Impacts on Business Growth & Organisational Competitiveness. Exceptions to the Above Statement are Duly Acknowledged in the Detailed Analysis of Study. The Hypothesis reconfirms to the Empirically proved statement that "ethical practices in business help to create favorable relationships with other organizations and establish long-term positive relationships with existing