Analyzing the diffusion of a multi-side ICT platform for urban logistics services: A System Dynamics approach

Model-based Governance for Smart Organizational Future

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BOOK OF ABSTRACTS

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WORKSHOP SCOPE

Today, the effective governance of any organisation - be it a government, a firm, a state-owned entity, or a charity - needs to be based on resilience, transparency, accountability, evidence of effectiveness. This need is stimulated by the all-encompassing public scrutiny of organisations, a trend continuously growing due to the advances in IT. This process has been described in terms of the emergence of technologies and practices of calculation in the context of governance.

A common problem is that organisations frequently approach governance as a process of conforming strictly to rules and regulations instead of considering it from a wider systemic perspective.

In this workshop, we called for both practical and theoretical research proposals for a better modeling of organizational systems as well as examples of successful application of model-based governance to any kind of organizational system.

WORKSHOP ORGANIZING INSTITUTIONS

The workshop has been jointly organized through the collaboration in place between BSLab, the Business Systems Laboratory, and SYDIC, the System Dynamics Italian Chapter, and thanks to the collaboration and technical support of DIAG Sapienza, the Department of Computer, Control and Business Engineering "Antonio Ruberti" at the Sapienza University of Rome.

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SYSTEM DYNAMICS ITALIAN CHAPTER

WORKSHOP HOSTING INSTITUTION

This Workshop has been hosted in Rome, at the premises of DIAG Sapienza, the Department of Computer, Control and Business Engineering "Antonio Ruberti" at the Sapienza University of Rome.

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Abstract

The rapid urbanization of world populations is increasing CO2 emissions due to logistics and handling activities (Wang et al., 2015). Therefore, all the problems related to the consequent growing freight transportation demand have led both public authorities and researchers to focus their attention on City Logistics (CL) initiatives. CL supports the integration of a logistics system wherein each actor is coordinated in order to reduce the negative impacts on citizens such as traffic congestion and air and noise pollution (Lam and Dai, 2015). Therefore, urban environments require specific policies at the local level, aimed at regulating a proper use of the available spaces and at identifying levels of satisfaction for different stakeholders with diverging interests.

In this context, forms of collaboration among the different parties are advisable to reach an increased level of efficiency for the logistics activities together with positive externalities for the

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environment. To this end, the URBeLOG project, funded by the Italian Ministry of Education and Research, was launched by a consortium of various CL stakeholders with the objective of developing a distributed, innovative, dynamic and participated platform of services and applications for last mile urban logistics. The platform is able to aggregate the involved stakeholders and manage the distribution process in real time. The URBeLOG platform has been designed for providing value-added services such as interface transactions for the use of logistics resources, dynamic tariff-based payments, management of certification and accreditation for the transport of goods within a city.

The purpose of this paper is to study the diffusion dynamics of the URBeLOG platform and its related services among the main potential user/customer segments in the Italian market. These are municipalities characterized by a limited traffic zone (ZTL), logistic service providers (LSP) and own freight carriers. The main levers of diffusion that have been considered are the Value Propositions that emerged during two different sessions of building a Business Model Canvas (Osterwalder and Pigneur, 2010). To this end, a variety of stakeholders were involved in order consider multiple points of view, namely: a public manager, an expert in urbanism, an ICT company, and a logistics consultant. The Business Model Canvas appears to be very useful, since it easily identifies the essential parts of a business, taking into account nine different pillars. One of them is the Value Proposition that can be defined as the combination of the benefits in terms of cost reduction, support for complex processes, and solutions to problems for the various customers. The identified Value Propositions have been then used as a basis to develop the diffusion model. For the municipalities, these are the "Green Credit System" that the platform is able to manage as interface between the public authority and the freight carrier and the effect related to the Policy Making Support and the Enforcement. For the Logistics Service Providers (LSP) the enhanced efficiency originated by a more proper routing management, the effect of focused adverting campaigns and the reduced footprint associated with the operations are considered as crucial levers of diffusion. Word of mouth is another aspect that has been taken into account. In the proposed study two kinds of word of mouth are analyzed: within a single population and cross-side between two populations, since it can be assumed that there are some forms of contacts among the different stakeholders that are likely to adopt the platform.

Basing on the Bass diffusion theory (Bass, 1969), the model is developed using the System Dynamics (SD) approach, in the light of its proven ability of simulating the behavior of diffusion via a

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system of interrelated causal feedback loops. The results of the simulation for a test bed area show that within the simulation timespan the three different populations of potential adopters almost fully join the URBeLOG platform. In particular, the 224 municipalities and the 9 LSPs complete the adoption process in 54 months. On the contrary, 2643 out of the 2688 own freight carriers adopt the proposed technology, thus the market saturation is not completely achieved. Therefore, the management of the green credits system, the policy making support and enforcement, the effectiveness of advertising campaigns, the routing efficiency and the effect related to a more environmental friendly foot print are crucial elements for entering the URBeLOG platform.

This work contributes to the field of studies associated with the investigation of the mutual relationships between the diffusion of innovative ICT systems among different interconnected populations of adopters in the CL arena. Also, this research fosters collaboration between public authorities and LSPs to identify the most important factors for adopting a shared IT CL platform. In addition, this work might assist public authorities in defining CL strategies by capturing the main levers related to CL policies prior to their implementation. From a LSP and own-freight carrier's point of view the study provides a tool to evaluate the performance of their activities with the adoption of new ICT technologies. Finally, the proposed model is a roadmap able to capture the enabling factors for the expansion of new forms of technologies and to simulate their behavior over time.

Keywords: City Logistics, Diffusion Model, System Dynamics.

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