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Using Market Data of Technologies to Build a Dynamic Integrated Acceptance and Sustainability Assessment Model

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Abstract

Research on technology acceptance and diffusion focuses either on micro perspective or macro perspective, but there is a gap in the literature regarding a universal approach that would help to evaluate technologies in an easy but comprehensive manner. Integrated Acceptance and Sustainability model was developed to fill this gap. The aim of the ongoing research is to create a model that would embed the functionality and respective advantages of system dynamics modeling. By using the data on the life span of selected innovative technologies the authors aim to reshape static model into a dynamic analytical tool that helps not only to evaluate the current condition of the technology, but also to make judgments on potential life cycle parameters of the technology under assessment. This article describes the steps that lead to achieve this aim.

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Keywords: Technology sustainability; Technology diffusion; IASAM

1. Introduction

Technology is a powerful component of the world and therefore the understanding of development, adoption and usage of technology is one of central concerns for researchers and practitioners across multiple disciplines. Some of these disciplines are – information systems, psychology, sociology, technology and science. In the scientific literature special attention is given to the research of complex sociotechnical systems.

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Sociotechnical systems are systems that contain technology subsystems and components central to its performance and having societal/political/economic relevance and impact[1]. In the development and functioning of sociotechnical systems many actors and many kinds of uncertainty are at work. All of those who help shape technology – engineers, business people, policymakers, and even users – are building the framework and social structure for the society in which humans live[2]. There are at least four different kinds of complexity to be dealt with:

- Structural complexity – the number of components in the system and the network interconnections between them
- Behavioral complexity – the type of behavior that emerges due to the manner in which sets of components interact
- Evaluative complexity – the competing perspectives of stakeholders who have different views of "good" system performance
- Nested complexity – the interaction between a complex "physical" domain and a complex "institutional" sphere[1]

The high level of complexity makes the analysis of eventual adoption and diffusion of innovative sociotechnical system very difficult. There are several theories that reflect the issues of acceptance, adoption and success of technologies and innovations, but none of them gives full understanding about the factors influencing acceptance, diffusion and sustainability combined. The authors propose the concept of sustainability for evaluation of the set of factors that let the technology to be developed, implemented, maintained properly (i.e. according to the needs of all stakeholders) and attract long-term users and create positive output and/or outcome according to the purpose of the technology and initial intentions of its developers (financial, social, etc)[4].Technology sustainability thus combines the different ways at looking at technology acceptance and diffusion and fills the gaps in the literature.

For measurement of technology sustainability Integrated Acceptance and Sustainability Assessment model (IASAM) was created in 2013[3].During research and development phases, the model has evolved to third version and is now referred to as IASAM3. IASAM3 evaluation approach is based on a viewpoint that technology acceptance research should not be divided apart from the technological, economic and social evaluation, in other words it introduces a new approach for evaluation of new technologies, by combining socio-economical aspects and technical characteristics of technology development and exploitation[4]. The principal distinction of this version is the use of adoption and diffusion data to build a dynamic and generic model. This model offers to make projections of the potential sustainability of technology that is being developed.

The following sections of this article are organized as follows. The next section describes recent research on innovation adoption and technology diffusion. The third section briefly describes the basics of IASAM3 methodology. The fourth section then introduces and explains the idea of using market data of other technologies to build a dynamic IASAM3 model. Finally, the conclusion contains a summary of the main ideas of the paper.

2. Research on innovation adoption and diffusion

Technological changes can often disrupt a market or industry's established rules, orders, beliefs, and values. The impact of such disruption can be so profound that it can threaten the survival of firms that fail to adapt. Organizations will succeed only if they are adequately aware of the new conditions and are able to overcome organizational inertia and embrace the change[5]. Perspectives from economics, sociology, and history provide powerful images of what technology is and does, and how people react to technology but each image is only a partial picture. One of the issues that the developers of technologies, researchers and organizers are most interested in is the potential adoption (and acceptance) of the technology and its diffusion within society and success in the market.

Many studies focus on behavioral aspects of technology acceptance or adoption. Technology acceptances are information service theories that model how users come to accept and use a specific technology. These theories suggest that when users are presented with new technology, a number of factors influence their decision about how and when they will use it. Many authors have studied different aspects of new technology acceptance from a variety of theoretical perspectives explaining the relationship between user beliefs, attitudes, and intentions[6].