Abstract—Today, many of our daily tasks are accomplished through the use of E-services that require user’s authentication based on specific number of digital identity attributes. These attributes are dependent to particular context of an E-services provider. For an end-user, different E-services may require different sets of attributes, which reside in multiple locations. More often digital identity attributes aggregation or fusion is needed to establish trust during the authentication process when accessing E-services. In this paper, we provide a literature review of major issues and challenges related to digital identity fusion. In the first line, we lay a particular emphasis on technical issues and in the second line we provide an overview of major economic and ethical challenges.

Digital identity; claims-based fusion; E-services access control; fusion issues and challenges.

I. INTRODUCTION

“To become singular, one must become plural”. In this famous quotation, Michel Foucault, a French philosopher, points out the relationship between multilateralism and unilateralism, political power relationships in networks. He says that to ensure the cohesion of unilateralism, links outside the domain must be forged. We find that his thoughts could also be extended to security in digital and service-oriented economy. Accessing E-services requires identity information cohesion and fusion. OECD Information Technology Outlook 2008 [1] highlights that broadband Internet is diffusing rapidly and it is accelerating online activities and E-services grant such as online shopping, education, use of government services, download and playing digital content, and use of video telephony.

In the offline world, anonymous transactions are conducted successfully, but in the online service-oriented world, service providers need to know identity information of the service recipient. Thus, building identity infrastructures is considered an attempt to establish a community of trust, which becomes a requirement for online business [2]. For instance, eBay community of trust lays on users’ identity aggregation-based reputations. More specifically, when E-services provider compels a combination of multiple identities residing in fragments within distributed and disparate business applications to be presented in order to fully identify the individual, identity fusion capabilities become a requirement for E-services access control.

This article deals with major challenges and consequences of digital identity fusion when accessing E-services. We present basic concepts of identity and digital identity in section two. In section three, we describe the importance and needs of digital identity fusion in general and particularly in the context of E-services. In section four, we stress on technical issues of digital identity fusion for users and E-services providers; and we provide an overview of major economic and ethical ones. We conclude in section five by providing few recommendations.

II. IDENTITY AND DIGITAL IDENTITY

A. Basic Concepts of Identity

The notion of identity is evolving over time. The term ‘identity’, which is firstly known used in 1570, has been used in many different ways in academic research and in popular usage [3]. The term is still of disputed origins, but its origin may derive from Middle French ‘identité’, from Late Latin ‘identitatis’, or probably from Latin ‘identidem’ repeatedly, a contraction of ‘idem et idem’ and literally ‘same and same’ [4]. Several decades ago, human identity was defined by geography, community, and family relationships. If an individual was born into a well-known and rich family or in a poor remote community, he or she would remain and would typically not be able to change their life pattern or economic status over time. One’s geophysical space and place in society were inextricably linked and the declaration of an individual’s name, sometimes accompanied by the name of their city or village, was sufficient to prove his identity. Today, individuals are having greater choice for participation in different social circles, and more possibilities and freedom of social and economic mobility. In addition, the notion of identity has been extended not only to humans, but animals, machines, organizations, devices, and other objects or resources. A machine has an identity that allows to access certain information at certain times, or be employed by some individuals, to the exclusion of specified others [5, 6].

‘Identity’ is defined as a collection of data about a subject that represent attributes, preferences, and traits. A ‘subject’