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Technological Forecasting & Social Change 73 (2006) 731–759

Technological Forecasting and Social Change

# Diffusion, substitution and competition dynamism inside the ICT market: The case of Japan

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Received 22 January 2005; received in revised form 23 July 2005; accepted 24 July 2005

**Abstract**

Under the new information society paradigm that emerged in the 1990s, contrary to its conspicuous achievement as an industrial society, Japan is experiencing a vicious cycle between non-elastic institutions and insufficient utilization of the potential benefits of information and communication technology (ICT).

However, a dramatic deployment of mobile telephones with Internet access service such as NTT DoCoMo's i-mode service in the late 1990s provides encouragement that, once the potential is exploited, Japan's institutional systems can effectively stimulate the self-propagating nature of ICT. The rapid deployment of Internet Protocol (IP) mobile service in Japan can be attributed to worldwide advances in the utilization of personal computers (PCs) and the Internet. Thus, a complex technology web triggered by the dramatic advancement of PCs and the Internet and co-evolving diffusion, substitution and competition dynamism has emerged in the global ICT market, particularly in Japan's mobile communication business.

The above observations prompt the hypothetical view that, despite a lack of institutional elasticity, recent advances in Japan's IP mobile service deployment can be attributed to a co-evolutionary dynamism between diffusion, substitution and competition inside the ICT market. Thus, policy questions could be how to create such a co-evolutionary dynamism by means of ICT innovation, enriched functions, reduced price and competitive environment.

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doi:10.1016/j.techfore.2005.07.008

In order to demonstrate the foregoing hypothesis, an empirical analysis of the mechanism co-evolving diffusion, substitution and competition dynamism inside Japan's ICT market is attempted by utilizing four types of diffusion models identical to respective diffusion dynamics.


*Keywords:* ICT; Institution; Institutional elasticity; Diffusion model; Mobile telephony; Internet

## 1. Introduction

Under the new paradigm of an information society which emerged in the 1990s, contrary to its conspicuous achievement in an industrial society, Japan is experiencing a vicious cycle between non-elastic institutions and insufficient utilization of the potential benefits of information and communication technology (ICT or IT, hereinafter refers as ICT) [1].

Comparison of the growth rate of ICT investment in G7 countries over the period 1985–1996 demonstrates that Japan's ICT investment level ranks third after the US and UK, and is comparable to other G7 countries [2].

Notwithstanding such investment in ICT, Japan's utilization of its benefits is hardly satisfactory as pointed out by OECD in 2001 [3]. OECD demonstrates the relationship between the access costs and a diffusion of the Internet in OECD countries which reveals that countries with lower access costs have more Internet hosts. However, in spite of its moderate Internet access cost enabled by the foregoing ICT investment, Japan does not achieve the expected Internet penetration rate. By contrast, the US performs fairly well. This gap should be attributed to the contrastive institutional elasticity of the two countries in an information society [1].

However, a dramatic deployment of mobile telephone with Internet access service (Internet Protocol (IP) mobile) such as i-mode service (NTT DoCoMO's mobile Internet access service) in the late 1990s provides encouragement that, once the potential is exploited, Japan's institution systems can effectively stimulate the self-propagating nature of ICT through dynamic interaction with them as is typically observed in high level utilization of IP mobile. ITU demonstrates that Japan's dependency on IP mobile out of total mobile telephony is conspicuously high as 72.3% in 2001 while the same ratio in the US and Germany is 7.9% [4].

Such a rapid deployment in IP mobile in Japan can be attributed to a worldwide dramatic advancement of personal computers (PCs) and the Internet [5].

In addition, rapidly developing *trans*-generationary substitution of mobile communicating system accelerates such dramatic IP mobile deployment [6].

Thus, a complex technology web triggered by the dramatic advancement of PCs and the Internet and co-evolving diffusion, substitution and competition dynamism as illustrated in Fig. 1 emerges in the world wide ICT market, particularly in Japan's mobile communication business.

These observations prompt us a hypothetical view that a dramatic deployment of Japan's IP mobile despite its institutional less elasticity can be attributed to a co-evolutionary dynamism between diffusion, substitution and competition inside its ICT market. Thus, policy questions could be how to create such a co-evolutionary dynamism by means of ICT innovation, enriched functions, reduced price and competitive environment.