The Progress of ISDN: In Germany and Beyond

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Five-hundred ISDN subscribers in Germany were surveyed to assess their experiences with the installation and usage of this technology. The results were compared with a prior study conducted in the United States. ISDN in Germany has been more popular among small businesses to support telephony and data transmission activities. Both US and German respondents have not fully utilized the capacity of ISDN services to support their communication activities. The major reasons were found to be inadequate support from service providers and incompatibility of ISDN hardware and software with existing systems.

Huge leaps in voice and data communication technologies and capabilities have resulted in a potential global information exchange infrastructure. This world-wide architecture is expected to evolve into seamless interconnection of all major networking protocols on a shared, well-managed backbone. Integrated services digital network (ISDN) technology is a major contributor to this environment. ISDN provides a network architecture, in digital format, to support the integration of voice, data, and image services over existing twisted pair telephone wires (Hertzoff, 1989). There are currently two ISDN services available: basic rate interface (BRI) and primary rate interface (PRI). The BRI, also known as 2B+D, provides two bearer channels of ISDN service at 64 Kbps and one control channel at 16 Kbps. It is appropriate for residential and small business users. The PRI provides either twenty-three (as employed in the United States) or thirty 64 Kbps bearer channels and one 64 Kbps channel for control. This service is better suited for organizations with a heavier demand for communication of voice, data, and/or visual images.

Although ISDN has been slow to come to fruition in the United States (Lai, Guynes, and Bordoloj, 1993), its use is widespread in many European and Asian countries. Among the European countries, Germany is the heaviest user of ISDN. By the end of 1993, 70% of all German territory and almost 100% of the western parts of the country already had access to ISDN services (Data Communications, 1993). In addition, over one million ISDN bearer channels were sold in Germany, as compared to Britain’s 300,000 channels and France’s 500,000 channels (Gronert, 1993).

This high market penetration gives the impression that ISDN technology has been very successfully diffused throughout Germany. But how is this possible when other countries, such as the United States, face considerable problems which prevent the rapid diffusion of ISDN (Lai, et al., 1993)?

The objective of this study was to perform a critical evaluation of ISDN implementation in Germany. More specifically, we investigated the experiences of ISDN installation, usage, and economic implications in Germany. German experiences were then compared with those within the United States. The results provide insight to other countries who wish to design effective strategies for ISDN introduction.

Literature Summary

The adoption and diffusion of ISDN is a relatively neglected area in the large and rapidly growing literature related to innovation research. Prior studies of ISDN adoption and diffusion have been conducted by researchers from both Computer Science and MIS disciplines, focusing on ISDN design, technology, implementation, or standards. The major MIS focus has been on the economic benefits (Philip, 1993), implementation strategies (Johnson and Cooper, 1990; Kennedy and Yen, 1989; Ramarapu, 1995), and adoption and diffusion (Lai et al., 1993; Lai and Guynes, 1994) of ISDN. The research approaches are primarily conceptual in nature, with empirical studies limited to ISDN usage and implementation within the United States (Lai et al., 1993; Lai and
Guynes 1994; Thachenkary, 1993). While successful implementation of ISDN within Germany appears impressive, there has been little research to validate these claims. Few articles covering the diffusion and implementation of ISDN within Germany have been published in the past decade. And, of these articles, the majority focus on marketing strategies (Kahl 1990; Peters 1990), applications (Peters 1990), or tariff structures (Kahl 1989; Kahl 1990), as proposed by Deutsche Telekom.

Cognit GmbH in Köln conducted a survey on the use of ISDN within Germany (TELETECH NRW, July 1992). This study was among the few studies that addressed the economic and organizational implications of the use of ISDN in Germany. Thirty percent of the ISDN subscribers in the German state of Nordrhein-Westfalen were surveyed. A response rate of twelve percent was achieved, based on a sample of 360 organizations and individuals. Their results showed that ISDN subscribers were primarily from the service sector (especially software houses), and were small organizations. However, since data were collected from only one German state, and a relatively low response (less than fifteen percent), their findings cannot be generalized for the entire country. A more detailed analysis, with a larger sample of firms, covering a broader area of Germany, would definitely provide more meaningful insight into the implementation of ISDN.

German Background

The German telecommunication infrastructure is based upon the Deutsche Bundespost (DBP) which, until recently, enjoyed a monopoly position. In the late 1980’s, the telecommunication functions were organizationally detached from the DBP and unified within a new publicly-owned organization, called Telekom. Telekom greatly pushed the diffusion of ISDN. It justified the introduction of ISDN to the general public by stressing its cost advantages and competitiveness of the German economy as a whole (Schön, 1986). While these advantages supported the decision of Telekom to introduce ISDN, they did not necessarily provide the incentive for German telecommunication users to adopt this new service.

Realizing the need for additional customer-based incentives, Telekom provided initial proactive support for ISDN until the diffusion process could carry itself (PC Woche, 1990). This support was primarily in the form of customer education and initial funding.

As with many new technologies, market understanding and acceptance are not guaranteed. Telekom tackled this problem by supporting the development of ISDN applications and publishing the promising results (Zeller, 1989). The primary objective was to adjust Telekom’s implementation efforts to the actual needs of potential ISDN users. This was achieved by supporting the exchange of implementation related experiences. At that time, pilot projects were initiated to improve the adoption and implementation of ISDN (TELETECH NRW, 1990).

Telekom provided financial incentives to early adopters of ISDN by subsidizing services and products to assist them with the high initial investment in the infrastructure, thereby providing a rate structure that was competitive with alternative services. These financial incentives were justified on the basis that it was expected that early adopters would provide greater benefits to the community as a whole, yet receive fewer benefits than later adopters.

In addition to a tariff structure that was comparable to alternative networks, Telekom provided direct financial support to attract new ISDN customers in an effort to achieve a critical mass of users (Claus and Schön, 1990). The financial support program was initiated in mid-1989 and, during that first year, Telekom provided between 30,000 DM (approximately $17,650) and 500,000 DM per organization (PC Woche, 1990). If an organization needed additional ISDN peripherals, Telekom furnished additional subsidies. These included 2,000 DM ($1,176) for small ISDN-based PBXes and 888 DM ($522) for ISDN PC-adapter cards.

Telekom’s efforts to educate the adopter and to provide financial incentives resulted in considerable growth in the number of basic and primary ISDN connections sold. The number of ISDN subscribers had significantly increased from 2,687 BRI and 415 PRI in January 1990 to over 220,000 BRI lines and 16,000 PRI lines in 1993.

To foster a higher ISDN subscription rate, Telekom fully integrated ISDN with the existing telephone, telex, teletex, and packet switching networks (Kahl, 1990). At the end of 1992, ISDN was available in 1,919 German cities (Data Communications, 1993). Telekom’s goal was to have ISDN available in all German cities (including what was formally East Germany) by the end of 1995. In order to speed up the progress of national and European ISDN standards, Germany formed a quadripartite cooperation with France, Italy, and the United Kingdom (Penn and Robin, 1990). More recently, Deutsche Telekom formed an alliance called Global One with France Telecom and Sprint to provide worldwide services for corporate clients (Financial Times, 1996). Telekom’s enthusiasm of ISDN is not confined to the standardization of the main ISDN equipment such as interface, functional performance, and hardware development. They have also developed several specific ISDN applications to accelerate deployment. It was because of these efforts that Germany has accomplished positive results in its ISDN implementation, which includes the establishment of a widespread national network.

Research Framework

Researchers and practitioners alike claim that Germany is at the forefront of ISDN implementation. This research was interested in seeking the extent of ISDN diffusion within German organizations after Telekom’s years of active planning for the introduction of this network technology. The model in Figure 1 explores the well-established relationships between innovation diffusion, extent of installation, usage magnitude, and economic benefit to provide a basis for understanding the progress of ISDN in Germany.
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