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Modeling Time Allocation to Leisure and Travel

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ABSTRACT

This multidisciplinary study has investigated the impacts of Information and Communication Technologies (ICT), as computers, telephones, or televisions, on leisure activities and leisure-related travel, developing and empirically validating the Time Allocation to Leisure and Travel (TALT) Model for analysis of personal time-budget, and for exploration of tradeoffs between personal-activity demands. Based on the time allocation concept, the personal utility maximization concept and travel behavior theory, the model investigates the relationships between non-leisure activities and leisure activities, whether or not ICT-based, as well as leisure-related travel. Despite expectations in prior research for reduction in travel as a result of ICT use for leisure activities, this study shows the impact of ICT on leisure travel to be merely negligible.

Keywords (Required)

ICT Impacts, leisure, tele-leisure, time allocation, PLS model.

INTRODUCTION

Information and Communication Technologies (ICT), such as computers, telephones or televisions, have penetrated all aspects of human life, including personal activities and travel (Mokhtarian, Salomon and Handy, 2004; Salomon, 1998). Over the last thirty years, high expectations and hopes have been raised in many studies, with some even expecting ICT to eliminate all travel and make cities obsolete, since participation in any activity could take place regardless of residential location (Lehman-Wilzig, 1981). These expectations, however, have not yet been realized (Golob and Regan, 2001; Salomon, 1998, 2000). The gap between reality and expectations might be the result of researchers' tendency to overestimate the importance of technologies and to underestimate the importance of social factors (Salomon, 1998, 2000), or due to the finding of Doherty (2003) that an opportunity, virtual accessibility in this case, does not necessarily lead to acceptance and usage.

Regardless of some critics (e.g., Lyons, 2002), the interactions between ICT and travel have been extensively discussed in the transportation literature (Mokhtarian et al., 2004; Salomon, 1998; 2000). One typology for first-order interactions between ICT and travel (Figure 1) includes four major direct impacts of ICT on personal activities and travel: substitution, complementarity, modification, and neutrality. A substitution impact (Figure 1a) is manifested when a location-based activity is substituted by an ICT-based counterpart, thus eliminating travel. A complementarity (generation) impact (Figure 1b) is manifested when ICT leads one to conduct new location-based activities which may not occur otherwise, thus generating travel so that the increase in ICT use is associated with the increase in travel. A modification impact (Figure 1c) is manifested when travel is neither eliminated nor replaced by ICT but modified in terms of trip timing, trip chaining, activity sequence, and travel mode. A neutrality impact (Figure 1c) is manifested when ICT does not affect other personal activities and the associated travel, thus increased ICT use leads to no change in travel. Although ICT is well recognized as a modifier of travel behavior, there is still vagueness regarding the substitution and complementarity of these modifications (Krizek, Li and Handy, 2005; Mokhtarian et al., 2004; Salomon, 2000). Second and third-order interactions, which are excluded from the present research scope, refer to changes in land use, residential and work location, and possible transformations of social norms and values (Salomon, 2000). Indirect interactions through the impacts of ICT on travel supply (e.g., intelligent transportation system) are beyond the research scope.

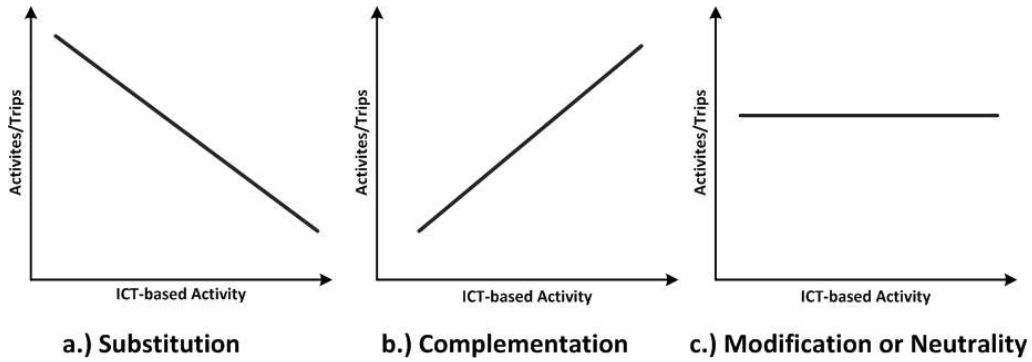

Figure 1. First-order interactions between ICT and personal travel
(Source: Senbil and Kitamura, 2003)

Various typologies of human daily activities are found in the literature, there is no consensus yet about a standard uniform classification of personal activities and existing classifications are context-dependent. This work has adopted the classification by Reichman (1976) depicted in Figure 2. *Mandatory* activities include work and work-related activities (subsistence), which provide the economic basis for the remaining personal activities including schooling. *Maintenance* activities refer to purchasing and consumption of goods and services aimed to satisfy individual/household physiological needs (e.g., shopping, banking, medical services) or biological needs (e.g., sleep, hunger, thirst, personal care), as well as obligations associated with being a member of a family and of society (e.g., housework, passenger pickup and drop off). *Leisure* activities encompass discretionary activities (e.g., going to restaurants, physical fitness, watching television or video). This typology is built upon the principle of individual motivations or purposes to engage in an activity, such as expectations to earn money, satisfy physiological needs (e.g., hunger, thirst, sleep), enjoy, and relax.

Figure 2. Typology of personal activity adopted in this research
(Source: Developed basing on trichotomy of Reichman (1976))

Statistical data from all over the world show that, regardless of cultural differences, there is growth in the average time allocated to leisure and decrease in the average time allocated to mandatory and maintenance activities, attesting to the increase in the perceived importance of leisure. Drew (2005) shows that on average people allocate most of their awaken personal time (5.32 hours) to leisure activities and, for example, to work and work-related activities about 3.6 hours (Figure 2). An increase in the quantity of leisure activities and their spatial distribution is also associated with the growth of time devoted to leisure, an aspect of great interest from the transportation perspective. Thus, leisure and leisure-related travel deserve careful and thorough research attention. People devote almost half of their leisure time to ICT-based leisure activities. Drew (2005) shows that more than 40% of leisure time is allocated to watching television and Istrate (2003) shows that about 47% of leisure free time is devoted to watching television or video. Practically, there is no one leisure activity that everyone participates in, not even watching television, and a person could participate in countless leisure activities. Furthermore, understanding and perception of leisure vary among different people and what could be leisure for one might

not be leisure for another. Travel associated with leisure takes a significant part of daily travel. In 2005, according to the Bureau of Transportation Statistics of the U.S. Department of Transportation, about 26% of all daily trips were related to social and recreational activities as visiting friends and relatives, going to movies or other entertainment events, taking vacations, or participating in sports activities. It is noteworthy that investigation of leisure travel is complex since it is interfaced with myriad leisure activities.

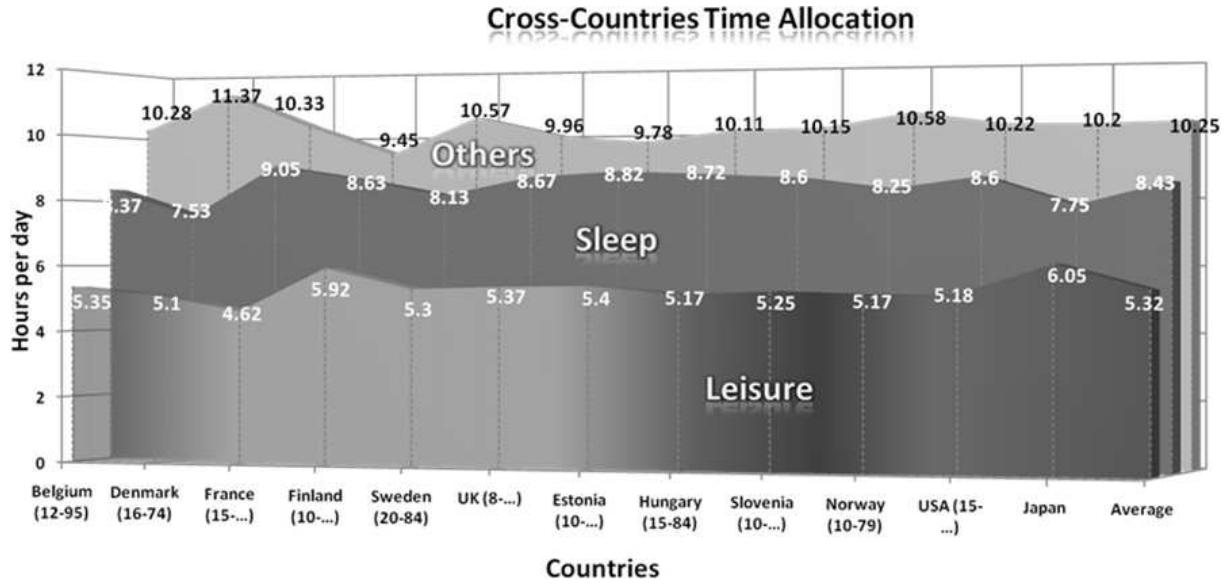

Figure 2. Daily personal time allocation
(Source: Developed bases on Drew 2005 Statistical Data of U.S. Department of Labor http://www.bls.gov/news.release/atus.nr0.htm, and Japan Time-Use Survey http://www.stat.go.jp/english/data/shakai/index.htm , accessed 25/11/07)

Investigation regarding adoption of a particular ICT application and its impacts on travel behavior has received much attention in the transportation literature (Handy and Yantis, 1997; Mokhtarian et al., 2004). The greater part of both theoretical and empirical studies has been devoted to investigating the mandatory ICT application tele-commuting (e.g., De Graaff, 2004; Mokhtarian and Salomon, 1997; Nilles, 1975). Fewer studies have been directed at investigating maintenance-oriented ICT applications such as tele-shopping, tele-education and tele-medicine (e.g., Fox, Montgomery and Lodish, 2004; Salomon and Koppelman, 1988; Yoh, Damhorst, Sapp and Laczniak, 2003). Even fewer studies have been directed at exploring the impact of leisure-oriented ICT applications, termed tele-leisure on leisure activities and leisure-related travel (Mokhtarian et al., 2004). However, ICT impacts on leisure deserve more research attention since people are allocating on average most of their personal time to leisure.

The under researched relationships between ICT and leisure activities have motivated this research, the goal of which is to analyze ICT impacts on personal leisure-oriented activity and travel patterns. Within the main goal, this research has two major objectives: 1) *develop* and 2) *empirically validate* the Time Allocation to Leisure and Travel (TALT) model for explaining the allocation of personal time which utilizes a new classification of leisure activities, conceptually developed in this study based on motivational factors, and for exploring the influence of ICT on leisure patterns and travel behavior. Meeting these objectives would help respond to the following three research questions, among others: First, what is the impact of ICT on leisure activities? Second, what motivational factors influence the demand for leisure? Third, is complementarity more prevalent than substitution as an ICT impact in the context of leisure?

THEORETICAL BACKGROUND AND MODEL DEVELOPMENT

ICT Impacts on Personal Activities

The definition of leisure given by Ragheb (1996, p. 253), is accepted for the purposes of this research:

"…leisure is the individual's mental, physical, social, and spiritual realization while fulfilling his/her self, characterized by discovering subjective purposes for existence, position in life (esteem), and relationships with others (having love and

belongingness) through the relatively freely chosen leisure and recreation endeavors of personal significance, exercising self-determination and intrinsic motivation, and claiming self-responsibility in those pursuits". Tele-leisure is defined as ICT-enabled leisure.

According to Mokhtarian et al. (2004), the reason that ICT impacts on leisure have remained almost ignored is that most researchers consider ICT impacts on mandatory and maintenance activities most important in the context of solving problems such as congestion, land-use, and environmental pollution. Thus, leisure-related travel is viewed as less economically productive than, for example, travel associated with work or shopping and, hence, less relevant policy-wise. Moreover, leisure-related travel can be a leisure activity in and by itself and people can be expected to be less interested in decreasing desirable travel in comparison to necessary travel (Mokhtarian, 2005a, 2005b).

Personal participation in various activities, investigated in transportation studies, can be seen via the lens of the time allocation theory (Golob, 2001; Goulias, 2002). The time allocation theory, which suggests that people try to allocate their time in a way which leads to the highest total utility, was assumed in most investigations of the tradeoffs between in-home and out-of-home leisure activities (e.g., Bhat, Sivakumar and Axhausen, 2003; Yamamoto and Kitamura, 1999). None of these studies, however, deals with the role of ICT. Handy and Yantis (1997) investigated the substitution between movie watching at home and going to the cinema. They found that there is no substitution effect, perhaps even an increase in travel, and these two activities could not be considered as equivalent counterparts, since going to the movie has primary attributes which are not achievable for home movie watching, such as an atmosphere of a public place accompanied with joint emotional reactions or the surrounding smell and sound of eating popcorn. These authors expect the substitution effect to emerge as soon as ICT development will progress to satisfying attributes inherent to non ICT-based activities. Until then, they expect ICT-based leisure activities and non ICT-based leisure activities to complement rather than substitute each other.

Senbil and Kitamura (2003) examined impacts of ICT on mandatory, maintenance, and leisure activities, using Poisson modeling, Tobit regression, and Structural Equations Modeling (SEM) to estimate the impacts of cellular and home telephone on travel behavior and found that the use of cellular and home telephones leads to enhancement of leisure-related travel. The literature review found substitution to be the most prevailing impact of tele-commuting and complementarity the most prevailing impact of tele-shopping and tele-leisure. The review also confirmed the lack of definitions, data, and theories, all of which are addressed in this study, which applies more advanced modeling approaches as, do the more recent studies.

Leisure Classification

Of the scientific perspectives used to investigate leisure (e.g. economics, psychology, philosophy, or transportation), the psychological perspective was adopted in this research (Figure 3), employing mainly the studies of Beard and Ragheb (1983) and Tinsley and Eldredge (1995). Leisure needs which one wants to satisfy, considered as desires, goals, or intentions, are depicted at the core of Figure 3. The motivational approach of Beard and Ragheb (1983) included four motivational needs as derived from Maslow's (1943) Leisure Motivation Scale: a) intellectual stimulation and self-growth; b) social interactions and friendship; c) competence and mastery intensification; and d) stimulus avoidance. Their motivational classification was adopted in this research with one modification, dividing the fourth stimulus-avoidance category into two groups within the same context, differentiating between action (active or passive) and rest activities, since most individuals engage in either action or rest to avoid stimuli. These five motivational groups (see dark layer in Figure 3) were then incorporated with the taxonomy of leisure activities (see the top of the two outer layers in Figure 3) proposed by Tinsley and Eldredge (1995), which clustered leisure activities into 11 groups (see the bottom of the two outer layers in Figure 3): 1) Cognitive stimulation; 2) Service; 3) Sensual enjoyment; 4) Belongingness; 5) Competition; 6) Agency; 7) Novelty; 8) Novelty; 9) Relaxation, 10) Self expression; 10) Vicarious competition; and 11) Residual. This research is not aimed at investigating all factors that psychologically influence personal decision to participate in an activity, which could be external, internal, or situational (Hsieh, Spaulding and Riney, 2004) and therefore, it is assumed that the key motivation in satisfying a leisure need is to gain one of the five presented benefits of leisure. Practically, a leisure activity can be motivated by more than one motivation. For instance, the leisure activity of playing chess with a particular partner might be simultaneously driven by social and intellectual motivations. However, in order to facilitate the empirical analyses in this study, one *primary* motivation is assumed for any activity and classification is according to the *primary* motivation of each activity.

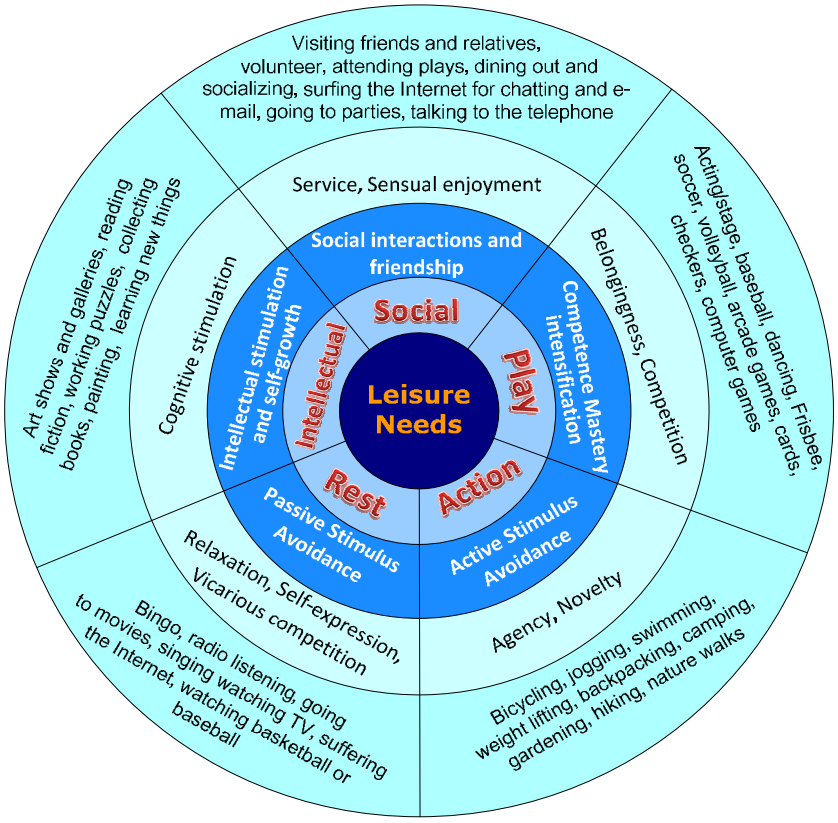

Figure 3. Classification of personal leisure activities adopted in the study

Model Development

The conceptual framework for this study has been developed based on the above described classification of personal activities, as well as on the time-allocation and personal-utility maximization concepts, the travel-behavior theory, and conceptual models of Golob (1999), Kuppam and Pendyala (2001), and Wang and Law (2007). The Time Allocation to Leisure and Travel (TALT) research model, presented in the Results Section (Figure 6), includes *mandatory*, *maintenance*, and *leisure* activity chains. The construction of each chain is based on the conceptual approach of Golob (1999), containing three elements: activity demand, activity-driven trip demand, travel-time demand, thus creating nine latent variables. The tenth latent variable in TALT is the *demand for ICT-based leisure activities*. The variable *leisure trips* and all other latent variables outside the leisure context are conceptualized as reflective latent variables, whereas leisure travel time and the two leisure activities (ICT and non-ICT related) are conceptualized as formative latent variables (Petter, 2007).

METHODOLOGY

The data for the research was based on the American Time-Use Survey (ATUS 2006) covering 12,943 Americans who provided data about how, where, and with whom they spent their time in a particular day (http://www.bls.gov/tus/). The ATUS data is representative of the distribution of the American society pertaining to demographics and time use. It provides information about time, duration, and type of activity.

Partial Least Squares (PLS) SEM method was employed for the empirical evaluation of the TALT model. PLS is designed to explain the significance of the relationships and resulting variance of dependent variables. Unlike covariance-based SEM, PLS attempts to estimate all model parameters in such a way that the result should be a minimized residual variance of all dependent variables (DV), and allows validation of reflective and formative latent variables (Chin, 1998; Diamantopoulos, 2006 ; Gefen, Straub and Boudreau, 2000). For the analyses and empirical validation of TALT model, SmartPLS 2.0 M3 (beta) analyses instrument (http://www.smartpls.de) was adopted.

RESULTS

The results (Figure 6), show that as expected, watching television is a primary ICT-related leisure activity (β=0.981, p<0.001), and that demands for mandatory and maintenance activities explain only 29% of the variability in ICT-related leisure activities.

As expected, this activity has a negative large impact on non ICT-related leisure activities (β=-0.638, p<0.001), yet its effect on leisure travel time and on leisure trips is insignificant. Also supported is the assumption that leisure trips is the most effective factor affecting leisure activities (β=0.590, p<0.001), explaining nearly 36% of the variance in leisure travel time. Although not within the focus of this work, the results also show that mandatory and maintenance activities negatively affect leisure travel and leisure time as expected. It also corroborates the literature maintaining that leisure is generally motivated by social needs, as in both non-ICT leisure activities and leisure travel time social requirement is the most effective motivation for leisure activities and travel, illustrated by the large beta coefficients. These results are discussed next.

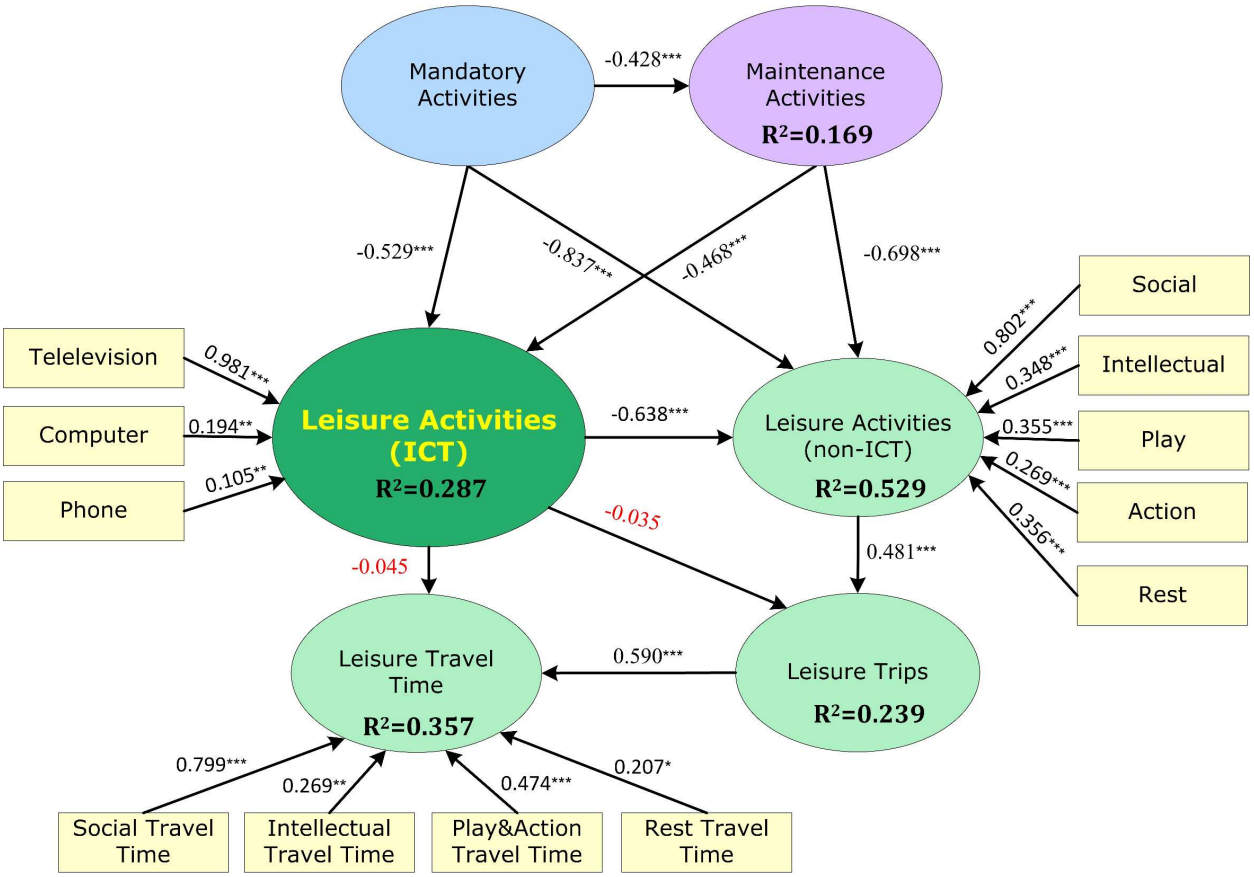

Figure 6. Results of the Time Allocation to Leisure and Travel (TALT) model

DISCUSSION AND CONCLUSIONS

This multidisciplinary research, referring to various disciplines such as leisure, sociology, psychology, economics and transportation, has three major contributions.

The first contribution is the classification of leisure activities. According to this newly-developed classification, the demand for a leisure activity is based on *social*, *intellectual*, *play*, *action*, and *rest* motivations. The second contribution is the development and empirical validation of the Time Allocation to Leisure and Travel (TALT) model for analyzing personal time budgeting and for exploring personal leisure demand. For empirical validation of the TALT model, the ATUS data

about 12943 households was transformed according to the new leisure classification, and analyzed using the PLS second-generation data-analysis tool. The third and most relevant contribution is the empirical support to the assertion that ICT-related leisure activities do not yet decrease leisure travel.

The TALT research model does not attempt to explain the *ICT-based leisure activity demand* since the construct might be considered as the *intention* to use ICT (for leisure activities), which is traditionally explained by factors of the Davis' (1993) Technology Acceptance Model (TAM), including *ease of use*, *usefulness*, and *attitude toward ICT*. Nevertheless, the TALT overall model does explain 29% of the *demand for ICT-based leisure activities* with time variables and thus, explains perhaps some of the uncovered variance of the traditional TAM, which generally neglects to address the aspect of ICT use for leisure and entertainment (one of the few exceptions is Agarwal and Karahanna 2000).

The findings of this study concerning the overall TALT model show statistically insignificant direct effects of ICT-based leisure on both the number of leisure-related trips and on leisure-related travel time. These findings, in line with previous research, provide evidence regarding the non-existence of a substitution impact and, likewise, the possibility of a complementarity effect. In contrast, the demand for mandatory activities has been found as the most powerful factor affecting leisure activity demand, both ICT-based and non ICT-based. The demand for mandatory travel time in turn, has statistically significant negative impact on the demand for non ICT-based leisure, but statistically insignificant influence on the demand for ICT-based leisure. If corroborated by further research these findings imply that individuals allocate time for ICT-based leisure activities regardless of mandatory travel pressures, attesting to the relatively inflexible habit of watching television which is the dominant ICT-related leisure activity.

In the leisure context, the key finding is that watching television is a primary activity forming personal demand for ICT-based leisure, while phone use is the least forming factor. Furthermore, the social factor is a dominant motivation for the demand for leisure that is not ICT-based, but the remaining four motivational factors - intellectual, action, play, and rest - have power as well. The TALT model explains about 53% of the demand for non ICT-based leisure, with ICT-based leisure activity demand playing a lesser role in explaining its variance than the role played by mandatory activity demand.

Similar to the demand for leisure that is not ICT-based, leisure travel time is mostly related to socially-motivated travel, with people spending the majority of leisure travel time to reach the destination of social activities. The second place is related to travel associated with action & play leisure activities combined. The empirical results show that the rest-related leisure activities have the least motivating power in generating travel time demand. The explanation for this finding is rooted in watching television, which is mostly related to the rest-related leisure motivation. Being a dominant leisure activity, watching television could satisfy the most rest-related leisure needs and thus, diminish demand for both rest-related non ICT-based leisure and rest-related travel.

ICT, however, is beginning not only to go beyond complementing location-based activities, but also to offer new ones, such as two people watching different programs simultaneously on the same television monitor. Additional directions that television technology is taking relates to adding functions as smell and touch, with the first commercially-available television allowing to feel smells (e.g., dishes in a cooking program) and touching things in three-dimensional virtual reality (e.g., goods in commercials) is already promised by Japanese researchers. In the future, perhaps, such ICT-based leisure activities could substitute some location-based activities and, thus, reduce leisure-related travel.

The results of this research show that the core leisure motivation is social and leads to generation of socially-related leisure travel. This finding, which suggests perhaps that the social motivation could also be a core motivation for ICT-based leisure, is supported by other researchers and may explain the growing popularity of social networks on the Internet as evident by the rising number of Facebook, MySpace, and LinkedIn users. Computer use already involves social activities as e-mail, chat, and VOIP, yet as evident in the present study, these do not yet substitute leisure-related travel.

Exploring ICT-based leisure in this study confirmed that watching television is a dominant activity, which is not yet substituted by other leisure activities based on computers or phones. Since many others predict growth of the time people will allocate to ICT-enabled activities in general, and to television in particular, it makes more sense to converge the three types of ICT-based leisure activities (television, computer, and phone) to one stationary or mobile medium. Sprouts of this tendency are evident in the new 3G and 3.5G mobile devices that support TV and DVD playing besides traditional functionalities as phone conversations and e-mails. Evidently, using these devises is not likely to decrease leisure related travel. For this goal to be achieved other types of socially-orientated ICT-based leisure activities should be developed that in the future will not only complement but also substitute non ICT-based leisure activities and the socially-related leisure travel associated with them.

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