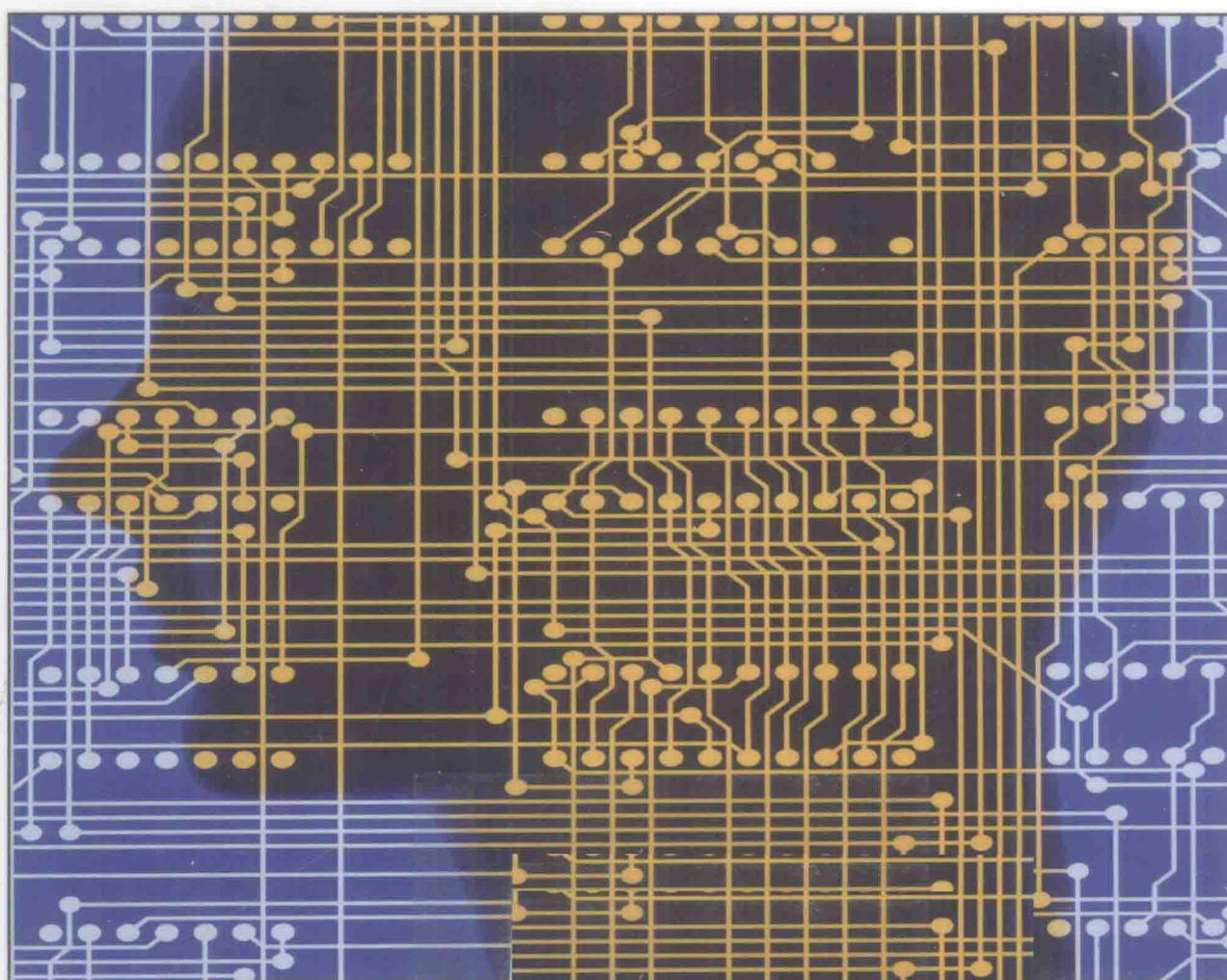


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# **Information and Communication Technologies, Society and Human Beings**

Theory and Framework



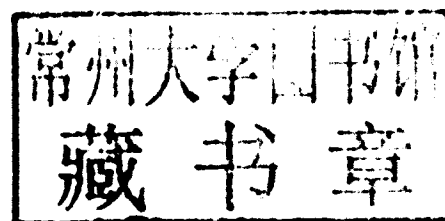
*Honoring Professor Gunilla Bradley*

DAREK M. HAFTOR & ANITA MIRIJAMDOTTER

# Information and Communication Technologies, Society and Human Beings: Theory and Framework

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## Foreword

It is a great honour for Linnaeus University to host the anniversary ceremony for Professor Gunilla Bradley.

On the 1<sup>st</sup> of January 2010 Linnaeus University opened its doors for the first time as the newest university of Sweden, the result of a merger between University of Kalmar and Växjö University. Linnaeus University is a modern, international university in Småland. Although Gunilla never worked at Linnaeus University, she represents its fundamental ideas in an excellent manner. Gunilla's research has been modern and international in the sense that she analyses the relationship between people, ICT, society and the environment. She proposes research questions for the future, and presents actions to achieve a good ICT society. Last but not least, Gunilla was born in Småland. Curiosity, creativity, companionship and utility – these are the terms by which we interpret Carl Linnaeus' achievements. This mission is also very much relevant for Gunilla's research. Linnaeus University would like to thank Gunilla for her significant research efforts and hope that she will continue to support researchers in informatics and media technology at our university.

*Stephen Hwang*  
*Rector*

*Lena Fritzén*  
*Prorector*

## Preface

In 1970's there were not many people that inquired about the psychological and social effects of this thing we today label '*Information and Communication Technology*'. Professor Emerita Dr Gunilla Bradley did this; and this is the key reason for the design and writing of this unique volume!

Recently, Professor Bradley celebrated happily her 70<sup>th</sup> birthday while continuing to astonish us with her formulation of new, yet not heard of, quests for knowledge – just as she started to do this nearly four decades ago...

To honour Professor Bradley, more than forty well established scholars, within various related disciplines, have contributed with leading edge essays. Each contribution articulates a set of aspects of information and communication technologies in human and social contexts, such as the individuals, groups, organisations and their management – addressing both descriptive and normative questions. In that manner, as a collection of research essays this volume represents a unique presentation of the field understood here as *Social Informatics*.

However, unlike most of available assembled volumes, this book offers its reader two additional contributions. Firstly, the included essays conceived together as a whole give rise to an emergent message, that none of the essay presents itself. The working assumption here is that the identified emergent message articulates the hidden structure of the intellectual field of Social Informatics.

Secondly, colourful biographical notes of Professor Gunilla Bradley are presented in a fashion that communicates some central characteristics of a pioneering scholar. Being recognised as one of the leading developers and proponents of Social Informatics, these biographical notes serve as a source of inspiration and role model for younger researchers.

We warmly welcome the reader into a journey of intellectual rigour, novelty, curiosity, drama, and futurology...

## INTRODUCTION

Information and Communication technology (ICT) and its effects on human beings and society is the theme of this book. By that, this book addresses the interaction between the ICT, the Individual, the Organizations, and the Society. Analyses of interactions, human effects and the interrelations are important since these result in reciprocal effects which may reinforce each other in both positive and negative ways. Changes in behaviour, perspectives, values, competencies, social and psychological aspects, etc. are all of human concern. This means that we need to critically reflect on how behaviour, values, competencies, etc. are influenced, shaped and directed by ICT use and thus, are being extended to the human and social conditions of mankind.

This recognition is by now established. Computer Science and ICT related disciplines work more and more together with behavioural and social sciences to contribute to studies of cognitive effects and changes, psychosocial changes, motivational and emotional changes, organisational and institutional changes, societal changes, value changes and new lifestyles; all these are examples of this extensive research area that addresses interrelations of ICT, Society, and Human Beings.

This book includes a unique presentation of the field of ICT and Social Change, which is an area of immense attention in contemporary life, both private and professional. The developments in computer technology, telecommunication technology, and media technology have led to, the so-called, converging technologies, which also converge our private and professional lives, and our private and professional roles. Professor Emerita Gunilla Bradley, to whom this book is dedicated, holds close to forty years of pioneering research in this field. A succinct extraction of her lifelong research is illustrated in the Bradley Convergence Model, which is presented in Section 2. The model as such is in principle a graphical illustration of ongoing changes in the Information Society, also called the Net Society. It synthesises theoretical frameworks in Bradley's research on psychosocial work environment and computerization based on experience from research programs starting in the 1970's and carried out during various phases of the history of computerization. The main message of the model is its articulation of key generative mechanism that ICT brings into our social world, which in turn transforms this social world. The Net Society is the emerging result driven by this generative and transformative mechanism. The Convergence Model, and Dr Bradley's research, has influenced and continues to influence and inspire scholars around the world.

This book is based on forty-three contributions mostly written by senior researchers, of which a majority have a lifelong research experience within the field of ICT and Social Change. The book also contains contributions from younger researchers who grew up with the new technology. Most of the contributions in the book are novel essays that represent contemporary international research. Yet, the book also embraces a historical perspective through some contributions written more than twenty years ago. In what follows, these essays are introduced and grouped in eight parts. These parts are all related to the life long pioneering research of Professor Emerita Gunilla Bradley and the influence and inspiration her work has had on scholars around the world.

The reader may also find this book as a guide that includes fruitful exploratory research orientations. These may serve as a point of reference for further research on what remains a profound challenge for our human endeavours: the future interconnected global society and economy, all by technology.

## **SECTION 1: GUNILLA BRADLEY'S RESEARCH JOURNEY**

The innovative nature of the research discussed in this book has been very stimulating for a long time, changing the world profoundly. With current technological developments, human actions have become more diligent, challenging the design of new technologies with an unprecedented scope.

Positively, the technological revolution has deeply affected many aspects of human lives, e.g., making it easier to communicate, socialize and develop relation over distances. To put forward this remarkable change, this part begins by presenting the colourful biography of Gunilla Bradley. This biography precisely presents innovative exploratory research, in relation to psychosocial and technological aspects, which are Gunilla's substantial and constructive contributions in her life-long pioneering research. It brings the context of many ideas where psychological, sociological and technological issues have engaged Gunilla for some time now, and inspired researchers across the world.

This part also contains two special essays written by Annagreta Dyring who has a long professional relationship to Gunilla and Geraldine Pratchett-Hultkrantz, Gunilla's best friend. Both have deep insights in the academic world. Annagreta gives a presentation of Gunilla's passion, strength and knowledge in the field of Information and Communication Technology. She illustrates in a very melodic manner the engagement of Gunilla's outstanding work and research in this field. She has remarkably described Gunilla's intuition and interests, especially with her role of stimulating women to contribute to areas of research, such as technological developments, which traditionally have been seen to belong to men. Geraldine's essay continues to bring up marvellous achievements and qualities of Gunilla's experience for many decades. She describes in a very tranquil way all of Gunilla's different challenges that have followed her life. Even more, Geraldine develops her essay by continuously presenting Gunilla's unique professionalism and fruitful contributions in the area of ICT to the whole world.

## **SECTION 2: THE CONVERGENCE THEORY ON ICT, SOCIETY, AND HUMAN BEINGS**

This part sets off by Gunilla Bradley's summarising overview of her Convergence Model and illustrations on ongoing changes in the Net Society. The description of the model is kept short and structured with reference to the concepts Globalization, ICT, Life Environment, Life Role, and Effects on Humans. For interested readers, the essay includes references to other publications where the theoretical framework, which this model builds on, is elaborated more.

The subsequent essays elaborate on parts of the Convergence Model. The first is William McIver's analogy to the science of 'Ekistics', i.e., human settlements, which include regional, city, community planning and residential design. He points at the comprehensive and systemic view of the Convergence Model which has provided a framework that enables understanding of the relation between previously studied disparate phenomena. He also put forward the model as a conceptual device for elaborating on advancing societal transformation toward improved human quality.

Larry Stillman and Tom Denison, in the next essay, make some comparisons between the convergence theory and Anthony Giddens's structuration theory. They suggest linking to Giddens's Structuration Theory and state that the model has the opportunity to mediate the agency-structure dichotomy. They underline that ICT mediates the constitution of both agency and structure and, simultaneously, the two create ICT. This perspective implies that ICT is both a product and a process of human intentionality and choices, and of social structures and impositions.

Kristina Orth-Gomér continues. Her contribution is an elaboration on the Convergence Model's contribution for the development of human well-being and this is done from a medical and public health perspective. Orth-Gomér recalls the variety of independent research that sends the same signal: the quantity and quality of human interaction in social settings is needed for human wellbeing! In this, the Convergence Model characterizes the societal dynamic of such human interactions, as induced and transformed by ICT. Moreover, Bradley's advancement of the so-called concept "Smart-homes" offers a future human environment that can enable such social interactions and, thus, contribute to the human well-being.

In the final essay of Section 2, Alice Robbin addresses a particular aspect of social interaction that is ICT mediated, namely the induced multi-tasking. Thus, the introduction of ICT in the various human and social context, work or private, exposes humans for constant and dynamic interruptions with

changes of attention and meaning, hence changes in mental or cognitive activities. In this context, the technological convergence as well as the convergence of conventional social roles and life environments may produce an increased opportunity for multi-tasking. This, in turn, may pose an opportunity and a challenge, in the latter leading to a cognitive burden, stress and failure. Therefore, there is a need for normative considerations of the design, introduction and utilisation of ICT, all aimed at Bradley's visions of a "people-centred perspective" in order to achieve "the good society".

To sum up the overall message of this part, Bradley's Convergence Model offers an understanding of the relation of converging ICT and globalization to the human and societal forces which are involved in societal transformations. This understanding, in turn, may guide us to directing the transformation towards the achievement of human well-being and control, rather than becoming its victims or products.

### **SECTION 3: PSYCHOLOGICAL & USABILITY ASPECTS OF ICT**

The contributions of Michael J.H. Smith and colleagues introduce section 3. Prof. Smith looks back at more than thirty years of acquaintance with Gunilla Bradley and her research. He acknowledges the inspiration and insight that he and many others around the world has gained through Bradley's research on how ICT transforms our daily lives and through her promotion of quality of life issues. The two subsequent articles are reprints of Human Factors and Ergonomics Society publications in honour of Gunilla Bradley, to illustrate her influence on their work. One article deals with how electronically monitoring worker performance may lead to psychosocial stress and related somatic symptoms. The second article hypothesizes that the psychosocial stress encountered in the working conditions, created by computer technology, may lead to musculoskeletal symptoms in workers independently from the physical ergonomic considerations of their work.

Michelle Robertson advances the relation between ICT, psychosocial work environment and health, including family life and leisure time. She points to research results that illustrate the complexity surrounding computer use and impact of ICT on knowledge workers. Her findings show that an individual's success of interaction with ICT, particularly the elimination of stress, is conditioned both by micro-aspect of the terminal, such as information and system design, and even more by macro-aspects, such as organisational structures, culture, leadership, role or job design, education and communication structures and processes.

Holger Luczak and colleagues are analysing their experimental evaluations of human-computer interaction among elderly people in terms of various input devices. Physical and cognitive deficiencies, which emerge in humans due to aging, limit the ability to interact with ICT. The findings based on their experiments support and emphasize that the technology have to be designed in a manner that compensates these deficiencies and, thus, facilitates effective ICT interaction.

The contribution of Vladimir Munipov illustrates the influence of Bradley's work on the development of social and psychological aspects of ergonomics in the former Soviet Union and Russia. Munipov suggests that the human-centred design of ICT, as advocated by Bradley, requires that human mental processes must be mediated by ICT in a comprehensive manner, so that human meaning is enabled and mediated. By that Munipov, drawing on Bradley's research, departs from the Russian prevailing model of cognitive processes as forms of activity.

Hal Hendrick's exploration of man's various cognitive styles – e.g. conformist or creative – shows that this does not only determine the way man cognises his or her problem situations at hand, but also

the way man interacts with his or her organisational context and with the ICT-mediated information. Hendrick found that in the latter context, cognitively concrete people want their information presented in a clear, unambiguous, step-by-step approach and are less concerned about the underlying rational, principles, or conceptual basis of the material. In contrast, cognitively complex people prefer to have the material presented in a manner that enables them to grasp the underlying concepts and principles.

Sebastiano Bagnara and Simone Pozzi advocate that in ICT design, including interfaces and mode of human interaction, the conventional approach of studying the average users, on which to base design decisions, should be given up. They argue for a HCI movement from a nomothetic research mode, that focus on the identification of general and universal mechanisms of human behaviour, to an idiographic mode, which looks upon the individual as a unique personality. The latter approach focuses on a personalised design, which adapts the mode of interaction to particular users needs and cognitive styles.

Linked to personalized design are approaches aimed at privacy-enhancing identity management as put forward by Simone Fischer-Hübner and John Sören Pettersson. They point to challenges in relation to HCI design for managing privacy in human and social affairs. The authors note that privacy-enhancing identity management implies that users can make informed choices about releases of personal data, selections of credentials for proving personal properties, and about their privacy and trust policy settings.

The final contribution of section 3 is Birgitta Bergvall-Kåreborn and Anna Ståhlbröst who elaborate the phenomenon of Living Lab. This is the term for a development and test milieu, where ICT may be shaped in a participatory and human-centred manner. The notion of Living Lab implies a real-life milieu where actual or natural human conditions and situations are part of the development process. This is a long step from conventional IS development approaches, which has little or no chance to account for human actual situations. In addition, the ultimate idea for the Living Lab milieu and approach is to offer new ways of managing innovation processes.

## **SECTION 4: ICT IN WORK LIFE AND PRIVATE LIFE – ORGANISATIONAL AND PSYCHOSOCIAL ASPECTS**

Eila Järvenpää and Stina Immonen address how ICT as a tool in the workplace has transformed the conduct of work. In this transition – from old-fashioned, paper and pen based office work, to contemporary knowledge-based and ICT enabled work profiles – they argue that little research is produced regarding the work, stress and well-being in the context of ICT enabling knowledge based work. Their study ranges from 1970's and onwards, studying the use of ICT applications for office work. They conclude that even though applications have become more advanced, the nature of (knowledge) work and user needs may not have been appropriately taken into account. The key focus of the published research seems to be put into visual display units!

Peter Hoonakker et.al. continue on this theme in their essay on work environment in intensive care units and the introduction of telemedicine. Although promising, research is needed in a number of issues, e.g., how tele-intensive-care-units affect communication and trust in the work team, how the technological environment affects staff work load, quality of care and patient safety. The authors set out to examine some of these issues from a socio-technical perspective including key factors related to work in virtual teams.

In the next essay Jacques Steyn argues that contemporary design of ICT and the employment of ICT in various contexts – also other than workplace – mimics the industrial work-place. He suggests that the

work-oriented design should be replaced by human-needs centred design, which will help to reduce task load, effort and stress, and open up for increased human satisfaction and well-being. Steyn exemplifies his ideas of this non work-space design approach through the function of social media, such as Facebook, that manage to satisfy the human need of social belonging.

Ulrika Danielsson and Karin Danielsson Öberg review research that addresses the blurring of the borders between workspace and leisure space, as induced by ICT. Today, being physically away from the workplace does not mean that we are necessarily changing to another environment or leaving our work tasks behind in psychological terms. The authors identify a set of challenges for humans, such as overload, stress and fatigue. Their suggestion to promote human well-being is to design ICT in a manner that articulates and communicates the distinctions between leisure and work. The design challenges are thus to attend to the borderlines between different life roles and life environments.

Hans-Erik Nissen, finally, elaborates on the design of ICT to enable human centred communication and action. He suggests that ICT design from a human-oriented perspective, should be broadened from ICT as a tool for control – of a machine or human being – to ICT incorporated as a means to facilitate sense-making, understanding and critical argumentation. Enabling juxtaposition of competing facts and values is a particular requirement for various democratic processes and empowerment of people dominated by unwanted structures, whether in the work-place or society. Nissen ponders on Web 2.0 enabled e-conferences as such means.

## **SECTION 5: E-CONFERENCES & E-LEARNING**

The essays of section 5 contribute to what Bradley refers to as Global Spaces, in this case, in the field of academic events and higher education. New possibilities and dimensions for teaching, learning and interaction are proposed. Pedro Isaías discusses using Web 2.0 to combine real and on-line conferences. Virve Siirak argues for instructional design, which blends ICT mediated and face-to-face communication and has a base in social constructivist learning theory, for developing both efficient learning and a learning culture. Finally, Elspeth McKay bases her argument in awareness of different cognitive styles when designing courses and courseware. For effective learning design her advice is attention to the human-dimension of human-computer interaction (HCI) as reinforced by Gunilla Bradley's Convergence Model. Professor Bradley's research into interactive effects of ICT tools taps right into some of the issues faced by people who utilize their right for information access. As illustrated in this part, the theory related to Bradley's psychosocial life environment and quality of life and well-being, has been an inspiration for researchers also in the field of e-conferences and e-learning.

## **SECTION 6: THE INFORMATION AND COMMUNICATION SOCIETY**

The Information and Communication Society provides us with unique challenges - opportunities as well as risks. This is the theme of the included contributions in section 6. Simon Rogerson looks afresh on the current potentials of the so-called Information Age, which has stimulated people across the world to communicate across the giant network, forming a new global society, the Information Society. Looking back at Gunilla's good society, the Information Society is seen as a potential to practice ethical considerations that are of great value, composing a good global society. Furthermore, Rogerson addresses the

very subject matter of ICT-devices: the information. He highlights that the central matter of ICT is the trustworthiness of the information provided by our tools rather than its quantity and frequency. He argues that the rapid development and integration of various kinds of ICT threatens the quality of provided information. Further, according to Rogerson, the dramatic consequences of unreliable information imply that we have a moral obligation to address information integrity. ICT allows us to blend forms, such as prose, poetry, music and pictures, and deliver them using, for example, writing and singing in either a serious or humorous fashion. We need to learn how to benefit from this varied diet of fit-for-purpose information and how to judge trustworthy information.

Peter Crowley continues in this theme by addressing the role of ICT for the continuous establishment and re-establishment of our civil societies. He stresses the need of mindfulness to avoid merely 'technology push' approaches where ICT is introduced as such, for the sake of itself, or only for commercial reasons. Crowley suggests engaging in the matter by converging a top down and a bottom up approach. By top down he proposes that governments and international organisations provide adequate literacy enabling structures, as well as affordable and accessible technology infrastructures. By the bottom up approach he proposes to include a self-organising civil society, both local and global. He argues that the bottom up is both desirable and necessary to complement the top down for reaching sustainable development and global justice. Challenges he points out, include avoiding permanently locked society into the divide of information-rich and information-poor, thus creating information feudalism or the 'digital divide'.

The growth of ICT support for a variety of social and community networks has allowed for a rich and complex range of interactions and methods of participation. Barrett Caldwell argues that the use of such networks can be considered as enabling technologies to support previously difficult social interactions, e.g., when being separated by time or distance, or experiencing complications due to social dynamics. To study social interactions in ICTs he suggests some quantitative analytical tools based on engineering and measures of efficiency and effort required to sustain connections between entities. These measures are referred to as mathematical properties of coupling, persistence and work functions. The belief is that our understanding of social and technological dynamics, and ultimately social networks behaviour in the Information Society, will progress and will be enhanced through applying the suggested tools.

Sarai Lastra addresses the ICT use and social factors for supporting democratic processes in communities. She proposes a participatory design approach for understanding the essence and ethos of a community. Her finding is that community events are assets that represent collective knowledge. These assets are formed by an emerging collective belief system that influences community actions and relationships. Lastra's proposed design approach aims for a high degree of participation by the community members with the purpose of aligning the ICT being designed with the community ethos.

The subsequent essay by Sangeeta Sharma addresses the focal research problem of how ICT can help in formation of socio-ethically inclusive societies with universal ethics as the epicentre. The process of globalization is unifying various cultures leading to the creation of Multiculturalists society. As an effect various ethnic groups are expanding their boundaries to form larger social structures. Although social mixing, ethnic groups have own social spaces where the concept of spatial management can contribute. Spaces of various ethno-cultural formations are merged into single social unit. The merging can be facilitated by building up mutual trust and respect for each other, which in turn can be reinforced by communicating with the help of Information and Communication Technologies. Hence, the role of ICT in enhancing the process of unification is crucial to develop social reconfiguration and new identities as it penetrates the tightened boundaries of ethnic groups.