Lecture Notes in Information Systems and Organisation 27

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# Organizing for Digital Innovation

## At the Interface Between Social Media, Human Behavior and Inclusion

Springer

# Lecture Notes in Information Systems and Organisation

Volume 27

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ISSN 2195-4968 ISSN 2195-4976 (electronic)
Lecture Notes in Information Systems and Organisation
ISBN 978-3-319-90499-3 ISBN 978-3-319-90500-6 (eBook)
https://doi.org/10.1007/978-3-319-90500-6

Library of Congress Control Number: 2018945087



Printed on acid-free paper

This Springer imprint is published by the registered company Springer International Publishing AG part of Springer Nature
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

# Preface

This book presents a collection of research papers exploring the human side of digital innovation management, with a specific focus on what people say and share on social media, how they respond to the introduction of specific IT tools, and how digital innovations are impacting sustainability and inclusion. Given the plurality of views that it offers, the book is particularly relevant for digital technology users, companies, scientists, and governments. The overall spread of digital and technological advances is enhanced or hampered by people's skills, behaviors, and attitudes. The challenge of balancing the digital dimension with humans situated in specific contexts, relations, and networks has sparked a growing interest in how people use and respond to digital innovations. The content of the book is based on a selection of the best papers—original double-blind peer-reviewed contributions—presented at the annual conference of the Italian chapter of the AIS, which was held in Milan, Italy, in October 2017.

Milan, Italy
May 2018

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# Contents

# The Innovation Agency: An Overview


**Alessandra Lazazzara, Raoul C. D. Nacamulli, Cecilia Rossignoli and Stefano Za**

The rise of digitalization is causing disruptive changes in business models in many industries and it is radically transforming how innovation should be understood and managed by scholars and practitioners [1]. New digital infrastructures (e.g. 3D printing, cloud computing), platforms (e.g. social media, virtual world) and ways of cooperation (e.g. co-design, co-production) are reshaping the meaning of innovation and introducing new challenges related to actors' interaction within digital ecosystems. According to Nambisan et al. [1: 224], digital innovation is "the creation of (and consequent change in) market offerings, business processes, or models that result from the use of digital technology". This broad definition introduces two specific features of digital innovation. The first is related to the flexibility offered by digital technology which is expanding the innovation phenomenon by not confining it anymore within the borders of an organization. This implies an increase in the fluidity of innovation process and also a continuous flux in which innovation outcomes may continue to evolve even after their delivery. The second feature concerns the potential for innovation agency to be distributed. It exploits the different actors

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A. Lazazzara et al. (eds.), *Organizing for Digital Innovation*,
Lecture Notes in Information Systems and Organisation 27,
https://doi.org/10.1007/978-3-319-90500-6_1

which are actually involved into the innovation process (e.g. individuals, organizations, customers, policymakers), underlying the paradigms' shift from the "good-dominant" to the "service-dominant" logic [2].

The book collects some of the best contributions presented to the XIV Conference of the Italian Chapter of AIS (ItAIS) which was held at the University of Milano-Bicocca, Milan, Italy, in October 2017. ItAIS is an important forum for scholars and researchers involved in the Information Systems domain and gathers national and international researchers to identify and discuss the most important trends in the IS discipline. The contributions included in this volume cover a wide variety of topics related to how individuals and organizations can successfully handle emerging challenges in new technologies implementation with a specific focus on what can be classified as human aspects of digital innovation.

Advanced technologies are permeating every aspect of people's work and life. The role of humans in such a rapidly evolving landscape is unquestionable and represents an essential driver for digital innovation. The increasing speed of digital adoption and the continuous emergence of new technologies make people's attitude towards technology a critical concern for organizations wanting to stay competitive and becomes a catalyst for innovation. Organizations who want to make the most of technology should bear in mind the attention to the "human side" or "human agency" of advanced information technology. Indeed, the relationship between individuals and technology is not unidirectional since individuals may both use the features provided by technology or try to resist or modify them in order to achieve their goals [3]. Therefore, people's skills, behaviors, attitudes, motivational traits and goals changes need to be better understood in order to innovate successfully [1, 2].

All the 21 selected papers which are reported in this volume have been evaluated through a standard blind review process in order to ensure theoretical and methodological rigor. The book has been organized into four sections covering (a) Digital innovation and its effect on individuals; (b) Digital innovation for inclusion and sustainability; (c) Innovative solutions in digital learning; (d) Organizing for digital innovation.

## 1 Part I: Digital Innovation and Its Effect on Individuals

The first part of the book explores the pivotal role of individuals in technology adoption and usage and the related effects on a number of important individual outcomes (e.g. job satisfaction, perceived benefits, user performance) in different kind of contexts (i.e. private and public organizations, digital service providers).

From the job design perspective, Sarti and Torre aim at disentangling the effect of ICT usage on the degree to which employees are satisfied with their current job by taking into account the moderating effect of six job dimensions. More specifically, they found evidence that three job characteristics—namely autonomy, formalization and the relational dimension of the job—significantly affect the relationship between the use of information technology and job satisfaction. This suggests that HR

professionals and managers should carefully take into account the technological dimension when designing a job. The nature of the job together with other individual characteristics are also analyzed in the paper by Caldarelli, Ferri, Maffei, and Spanò which applies the Technology acceptance model (TAM) in order to investigate the existence of the differences in information systems usage between two different groups: accountant and ICT workers. The authors ask for greater emphasis on the analysis of personal and cultural variables that can affect information systems intention to use and to further consider them in the development of implementation strategies within companies.

Moving to the context of the public sector, Tursunbayeva, Bunduchi, Franco and Pagliari explore the effect of the implementation of a Human Resource Information System (HRIS) in a healthcare organization by means of a case study methodology. Interestingly, studies on HRIS benefits rarely examine the kind of expected benefits that motivate different stakeholders (e.g. hospital managers, clinicians, nurses, HR professionals) to accept new HRIS initiatives. This study develops an extended model of the expected and realized benefits of HRIS for different users and maps the interconnections between these benefits in healthcare. Moving to a specific sector of Public Administration, namely judicial system, Lepore, Pisano, Alvino and Paolone investigate the relationship between individual cultural orientation and information system's individual impact. More specifically, they highlighted how group-oriented, dynamic and entrepreneurial features in organizational cultures are successful factors in the implementation of information systems.

As a conclusion to this section, the topical theme of personal data protection is investigated by Gómez-Barroso, Feijóo and Palacios. The authors apply the theory of planned behaviour (TPB) to a representative survey of 1500 Internet users in Spain to test how users' knowledge about service providers usage of personal data influences privacy attitudes, intentions and disclosure behaviour. The study reveals that increasing users' awareness and knowledge about the mechanism of exchange of personal data for improved services can encourage control of personal data.

## 2 Part II: Digital Innovation for Inclusion and Sustainability

The effect of digital innovation goes beyond its role in boosting performance and productivity—both at the individual and organizational level—and it may have a huge potential in terms of addressing inclusion and sustainability challenges. However, there is also a dark side in new technology adoption such as the negative effect on specific social groups because of a distort use of social media and their role in creating and spreading specific representations of members of certain social categories. This is the focus of the study by Perna, Varriale and Ferrara which analyses how media, and more specifically social media, have contributed to the spread of distorted and stereotyped images of nurses hence negatively affecting

their reputation as qualified professionals. This representation of nurses on social media has a number of negative organizational consequences such as issues in recruiting and organizational image and brand. Prejudice and discrimination affect another social group, namely women in science and technology careers. D'Agostino and De Nicola apply semantic social network analysis to gender diversity in the Italian information systems community. Although there was an overall lower participation of women in this specific community, leveraging on their analysis the authors conclude that there is no evidence of gender discrimination and that men and women have an equally relevant role in the advancement of the information system discipline. Moreover, digital innovation may play a role in solving specific social problems. This is the case of crowd funding for social causes, a phenomenon which is quickly gaining popularity. Di Pietro, Spagnoletti and Prencipe analyze donations collected by a charity-crowd funding online platform and show the negative influence of a poor technology infrastructure as well as the positive effect of individuals' digital skills and social network interactions. Those results may be useful for leading the development of successful charitable initiatives and contribute to the further development of digital social innovation.

Another important aspect of digital innovation is its role in reinventing collaboration by facilitating the participation of various actors in the innovation process and gaining sustainability. Indeed, as described by Romanelli, Metallo and Agrifoglio, participation and technologies are the key issues to be addressed for future sustainability since they enable cities to become smart cities. Their contribution presents the concept of sustainable and smart cities and describes the role of citizens' participation as a means to engage them in decision-making processes concerning the development of urban areas. In this vein, interactive technologies, platforms and tools are a crucial prerequisite in order to support cities towards a sustainable development. However, according to Spagnoli, van der Graaf and Brynskov, especially within the smart cities' context there is a plethora of definitions of service co-creation and a large number of tools and platforms taken into account from different perspectives and disciplines without any harmonizing effort. Therefore, their study analyses methods and tools adopted by different cities in order to implement co-creation processes in collaboration with different stakeholders and tries to define the methods and digital tools that cities should pursue to fully exploit the potential of these platforms in terms of enhancing global collaborations. Among the main challenges cities are facing in terms of co-creation, those related to engaging the stakeholders and organising co-creation activities with new actors around virtual communities are the biggest. The engagement of citizens in collaboration is extremely useful and provides new possibilities and advantages for complex scientific research projects such as the one described in the paper by Bolici and Colella. Their paper aims at contributing to the "open/citizen science" research domain by examining and testing public engagement activities for a robotics research project and determine a series of guidelines useful to design public-engagement initiatives. Therefore, increasing citizen participation is one of the main components of the future sustainability challenges and can help governments to be more responsive to community and scientific needs.

## 3 Part III: Innovative Solutions in Digital Learning

As the digital technologies are reshaping organizations and workplaces, innovations and transformations in education and learning are underway. Technology-based learning is the future of training and there is a flourish of terms and concepts referring to the new forms resulting from digital technologies applied to learning. However, the growing interest and the increase in the number of publications on this topic has led to confusion rather than more understanding of the phenomenon. On the basis of this assumption, Caporarello, Giovanazzi and Manzoni perform a content analysis on the last twenty years of research and discuss the use of the most diffused 16 learning terms in the literature. They provide a comprehensive learning model that clarifies interactions and interdependencies among the terms and offers some insights for both practitioners and scholars. The growing shift towards technology-based learning is coupled with the spread of gamification, that is, the use of game design elements in non-game contexts. Caporarello, Magni and Pennarola provide a new definition of gamification for learning and an overview of applications. Moreover, the paper presents and discusses research on the effectiveness of gamification for learning purposes, focusing on students' attitude, knowledge and behaviour, which constitutes one of the main gaps in gamification literature. Specifically related to the topic of gamification is the concept of absorption, which is a sense of high psychological involvement that someone can experience when performing a task or a game. Many previous studies consider absorption as a positive antecedent of training outcomes and in their contribution, Aliberti and Paolino address the challenges posed by technological learning environments characterized by high degree of absorption. More specifically, the two authors tried to disentangle the effect of two negative antecedents of absorption, namely distraction and boredom, on learning and training transfer by proposing a theoretical model. Furthermore, they aim at exploring the role of creative climate in these relationships.

This section presents several innovative solutions related to digital learning in the higher education scenario. In their chapter, Previtali and Scarozza focus on the changes undergoing in the Italian university sector due to the rise of online educational programs. Using a case study, the authors describe the blended learning adoption and implementation by an Italian University and identify institutional strategy, structure, and support policies that could lead to the improvement of teaching and learning conditions. Moreover, they shift from students to faculty members' perspective in disentangling factors which most likely affect satisfaction in a blended learning program. Finally, the last contribution of this section presents another very innovative blended learning form which is called e-internship. Jeske and Axtell analyze this new kind of internship which requires no or minimal in-person interaction since work and collaboration on projects are supported by online tools and software. The number of e-internship is growing across different countries and is posing new research questions about how people learn in virtual contexts and also about how higher education institutions can manage college-to-work transitions.

## 4 Part IV: Organizing for Digital Innovation

Companies involved in digital transformation efforts may require substantial changes in roles, routines, processes, departments and the overall organizational structure. However, there is not a one-size-fits-all solution. Rather, the design of the digital transformation journey starts with the analysis of the particular needs of the organization together with the identification of competitive advantage sources and the formulation of strategic priorities.

Although SMEs are considered to be slower than larger firms in adopting digital technologies, digital innovation may improve their competitiveness with new products, services, processes and businesses models. Therefore, in order to keep customers and expand their markets SMEs are increasingly adopting e-business. De Paoli and Za present a pragmatic approach to defining a model aiming at facilitating the design and implementation of e-business for SMEs. This is an interaction-based model which distinguishes between different levels of interaction among internal (the entrepreneur, employees) and external (clients and suppliers) actors. Indeed, understanding and engaging external and internal customers and how those relationships differ from the online ones is a central anchor of digital innovation. Adopting the external customers perspective, Pennarola, Caporarello and Magni perform a comparative study among four companies in the jeans manufacturing and retailing industry in Italy operating both in the online (e-commerce websites) and offline (stores) channels. The authors analyze how the product return strategies differ among online and offline retailers and the effect of such strategies on consumers' attitude to purchase again and to return the product. With a focus on internal customers, Galanaki, Lazazzara and Parry try to classify configurations of e-HRM actually existing at the global level. By combining the actual degree of technological presence and the degree to which the technology is used to enable HRM activities, they identify four types of e-HRM configurations named "non-usage", "HR primacy", "Integrated e-HRM", and "IT primacy". Creating value for employees and managers is one of the main drivers for new technology adoption for HR purposes but the lack of cooperation between IT and HR departments generates hybrid and unsuccessful e-HRM configurations.

Moreover, within the context of digital innovation social media constitute important platform for stakeholders' engagement and may reshape marketing and communication strategies. Metushi and Fradeani perform content analysis on social media posts by large Albanian companies in order to analyze how companies adopt social media. Although social media usage has an important role in increasing company's audience and there is a positive relationship between a company's social media activity and sales. Companies adopt social media mainly for marketing purposes but are still not considered as a communication tool able to increase firms' transparency. In the same vein, Gesuele and Celio analyze social media adoption in a specific context, namely municipality, as a means for citizen engagement. Using the case study methodology, they explored the official Facebook Municipality account activities of the City of Naples in terms of contents disclosed and impact on

citizens. They reveal that through social media usage municipalities are enhancing their social image and improving the citizens' participation, but a true adoption for co-design purposes is yet to come.

Finally, we are grateful to the Authors, the Conference Chairs and Committee members, to the members of the Editorial Board and to the Reviewers for their competence and commitment. This publication would not have been possible without their active and generous contribution.

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# Part I
# Digital Innovation and its Effect on Individuals

# ICT Use and Job Satisfaction. The Moderating Role of Task Characteristics


**Daria Sarti and Teresina Torre**

**Abstract** This paper focuses on the relationship between ICT use and job satisfaction, following a classic but always relevant research stream, and analyses the role of work design in moderating this relationship. The findings of the analysis, carried out on a sample of 35,187 employees in Europe (data source: EWCS2010), demonstrate that the use of ICT is important in bolstering the individual's satisfaction about his/her own work. We also demonstrated that job design plays an important role in determining the strength and the form of the relationship between ICT use and job satisfaction. Our results offer interesting stimuli for a debate among scholars and practitioners on the management of employees in a context in which technologies represent an indispensable tool for workers, so that the role of the organization is to "design" tasks properly so as to grant them this new way of working.

## 1 Introduction

In the last decades, the technological revolution has deeply modified the content of work and the way in which it is performed. For example, routinized tasks, which were carried out by employees in the past, are accomplished nowadays by technological equipment. Intellectual work has been influenced by modern technologies, which are used as normal tools. In general, these technologies have enabled individual to work to achieve a higher level of potential, though at the same time some drawbacks have emerged.

Starting from this premise the aim of our work is to understand the impact of ICT use in the work context correlating it to the more traditional dimensions with

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A. Lazazzara et al. (eds.), *Organizing for Digital Innovation*,
Lecture Notes in Information Systems and Organisation 27,
https://doi.org/10.1007/978-3-319-90500-6_2

which the organization 'manages' the work dimension. We are referring to work design, which is considered a central element in organizational issues, thereby showing its relevant connection with job satisfaction (JS). Furthermore, we are interested in analyzing whether there is an interaction between job design components and the use of ICT in favoring or disrupting JS. In our opinion, the influence of work characteristics on the relationship between ICT use and JS has been neglected, even though it might represent a useful lever to understand how it works and some of its elements might offer major support to ICT technologies.

The paper has been organized in the following manner. In the second part, the theoretical background is presented and our hypotheses are introduced; in the third section, we present the analysis and the most relevant results. Finally, some preliminary suggestions are introduced in relation to our questions and then considerations useful for future research activities are proposed.

## 2 Theoretical Background

### *2.1 Work Design and Employees' Job Satisfaction*

Work design has been recognized for many decades as a prominent strategy for improving the productivity as well as 'the quality of the work experience of employees' in organizations [1: 250]. Starting from the last century, thousands of studies have been conducted that have examined work design issues and presented different complementary dimensions for the design of jobs, like the ones introduced by Mintzberg [2]: specialization (horizontal and vertical), work formalization and training. Indeed, as suggested by Morgeson and Humprey [3], work design was demonstrated as important for a range of individual, group, and organizational outcomes [4, 5].

In the table below, we refer to three pivotal studies in this field that give rise to three different diagnostic instruments useful to analyze job characteristics, these are: the Job Diagnostic Survey-JDS [1, 6], the Work Design Questionnaire-WDQ [3] and the Job Content Questionnaire-JCQ [7] (Table 1).

The precursor among the job design models, the one by Hackman and Oldham [1, 6], was born in order to suggest that job design and job re-design might represent an important foci of motivation for employees. Nowadays, this pattern represents the one most extensively used in academic literature (e.g. [8]), as well as the most popular one cited in current manuals (e.g., [9]).

According to Hackman and Oldham [6: 160] positive employees' outcomes — such as motivation, satisfaction, quality performance, low absenteeism and turnover — are achieved in a given working environment 'when three critical "psychological states" are present for an employee (experienced meaningfulness of the work, experienced responsibility for the outcomes of the work, and knowledge of the results of the work activities). […] these critical psychological states are created by the presence of five "core" job dimensions.'

**Table 1** Synthesis of the pivotal studies on job characteristics (*)

| Study's reference | Hackman and Oldham (1975, 1976) | Morgeson and Humprey (2006) | Karasek et al. (1998) |
|---|---|---|---|
| Validated Instrument | Job diagnostic survey (JDS) | Work Design Questionnaire (WDQ) | The Job Content Questionnaire (JCQ) |
| Dimensions in the theoretical model | *Skill Variety*<br>*Task Identity*<br>*Task Significance*<br>*Autonomy*<br>*Feedback* (*)<br>*(dealing with others, feedback from agents,*<br>*feedback from the job)* | Task characteristics<br>*Work scheduling autonomy*<br>*Decision-making autonomy*<br>*Work methods autonomy*<br>*Task variety*<br>*Significance*<br>*Task identity*<br>*Feedback from job*<br>Knowledge characteristics:<br>*Job complexity*<br>*Information processing*<br>*Problem solving*<br>*Specialization*<br>Social characteristics<br>*Social support*<br>*Initiated interdependence*<br>*Received interdependence*<br>*Interaction outside organization*<br>*Feedback from others*<br>Work context<br>*Ergonomics*<br>*Physical demands*<br>*Work conditions*<br>*Equipment use* | *Skill Discretion*<br>*Decision Authority*<br>*Skill Utilization*<br>*Decision Latitude*<br>*Psychological Job Demands*<br>*Supervisor Social Support*<br>*Co-worker Social Support*<br>*Physical Job Demands*<br>*Job Insecurity* |

*Note* Feedback which represents just one dimension in the authors' theoretical model, in the JDS was divided in three sub-variables (here in blankets)

In the same work, the Authors provide the definition of the relevant job dimensions [6: 161–162] and their theoretical model, developing the JDS as an instrument that provides measures of the core dimensions.

The job dimensions they included are reported here now. *Skill variety* means 'the degree to which a job requires a variety of different activities in carrying out the work, which involves the use of a number of different skills and talents of the employee'. *Task identity* represents 'the degree to which the job requires completion of a 'whole' and identifiable piece of work—that is, doing a job from beginning to end with a visible outcome'. *Task significance* is described as 'the degree to which the job has a substantial impact on the live or work of other people—whether in the immediate organization or in the external environment'. *Autonomy* is considered to be 'the degree to which the job provides substantial freedom, independence and discretion to the employee in scheduling the work and in determining the procedures to be used in carrying it out'. *Feedback from the job* is 'the degree to which carrying out the work activities required by the job results in the employee obtaining direct and clear information about the effectiveness of his or her performance.' [6: 161, 162].

Furthermore, two supplementary dimensions were included by scholars in the analysis. These are: *Feedback from agents,* which is described as 'the degree to which the employee receives clear information about his or her performance from supervisors or from co-workers', and *dealing with others,* which is 'the degree to which the job requires the employee to work closely with other people in carrying out the work activities' [6: 162].

Nevertheless, there are several criticisms about JDS [10]. According to Morgeson and Humprey [3], it focuses on a narrow set of motivational job characteristics whereas a number of other important work characteristics are ignored [11]. The point of view of some authors is that 'if scholars simply use the JDS without examining the larger work design literature, their research runs the risk of being deficient.' [3: 1231]. In this respect, they propose other dimensions apart from the task characteristics, such as: knowledge characteristics, social characteristics and work context.

Despite all that is stated above, only the dimension of task characteristics (as determinant of employee's positive outcomes) is considered here; in fact, in this work, our aim is to focus specifically on aspects that are more closely related to the issue of organizational design. Indeed, such an aspect, and its specific scale, have been widely used in a large number of previous studies, focusing specifically on a part directly related to the content of work in its authentic dimension of job design.

JS is typically defined as a multifaceted psychological construct that measures the degree to which employees are satisfied and happy with their current jobs [12, 13]. It is strictly related to all the characteristics of the job. Indeed, if employees are satisfied with their jobs' characteristics and the overall job it is likely that they will work harder; however, if their JS is low, this will discourage employees' commitment and may also increase their willingness to quit the organization and the job [14, 15].

The conventional approach in the literature on JS [16] assumes that utility from work depends on a number of traits of the individual, on the features of the firm and job characteristics. Furthermore, according to the JD-R model, working conditions refer to those physical, social and organizational aspects of the job, which describe the whole work context [17, 18].

In the literature, it is widely acknowledged that some characteristics of work favour the positive attitudes of workers and, at the same time, reduce counter-productive behaviours. Some studies suggest that the dimension of continuous learning activities and skills development for specific professions increases JS and retention and enables continued provision of high-quality services [19–21]. Furthermore, other researches demonstrate the importance of perceived autonomy and control on JS and the quality of care [22, 23].

Hence consistent with prior studies in this area, we posit that a statistically significant relationship exists between job characteristics and JS. Thus:

- Hp1. Task characteristics have a significant relationship with JS.

## *2.2 ICT Use, Work Design and Employees' Job Satisfaction*

A number of studies have highlighted both beneficial and detrimental effects in the use of technologies at work. Despite this, authors claim that few studies have examined the impact of ICT on employees' well-being [24]. According to recent reviews, the use of ICT in the workplace can have both positive and negative effects on employees' work experiences [25, 26]. In other words, ICT may be perceived as both a resource and a work demand [25].

Some researchers underline the positive effect of ICT use considering it an instrument enabling individuals to be 'closer' to them, in terms of time and space, and in so feeding their social relationships. Authors highlight the positive impact of new technologies on the increase of individuals' overall job satisfaction. In particular, it has been shown that ICT use favours a growth in the rate of communications among employees, improves bottom-up flows of communication, reduces status differences and promotes equality. Furthermore, it stimulates participation in problem-solving and decision-making [27–29].

Recent literature suggests that in modern workplaces ICT use can increase job demands due to increasing expectations and employee accessibility to the workplace [26]—which in turn can have a negative impact on employees' health and well-being [25, 28, 30] and family-to-work conflict [31].

However, if we start from the pivotal study of Chester Barnard [32] and from his idea of the organization as a 'cooperative' system-, in which the satisfaction of both the organizational goals and individuals' needs have to be pursued - we can approach ICT as an 'instrument' and a 'mean' for the achievement of the above mentioned twofold goals. Thus, we believe that a conscious use of such an instrument is pursued within a context in which the social nature of the organization as a 'cooperative system' is a constitutional element.

In this vein, we posit that:

- Hp2. ICT has a positive and significant relationship with JS.

A moderation effect is assessed, wherein researchers aim to understand the role that a third variable—i.e. the moderation variable—may have on the relationship between a dependent variable and an independent one. In particular, if a moderation exists the moderator variable affects either the form or the strength of the relationship between a predictor and a criterion variable [33].

In the introduction to this paper, we mentioned that following the huge increase in ICT use at work some variance has to be included in job design. Indeed, on the one hand, personal computers (PCs) represent nowadays the principal tool for many kinds of works. They allow people to store huge amount of data and information and provide aids towards in computing, decision-making and problem-solving. This kind of support represents a useful instrument for routine activities even though it is claimed that it might fail to favour creative and intellectual tasks [34]. Furthermore, PCs are today equipped as a mass communication medium, which enables individuals to be connected with others all over the world via the world wide web. Thus, the new technology increases the democratization of communication, favours immediate feedback and reduces costs in coordination.

In this paper, our aim is to understand whether job characteristics may represent a useful lever to implement the main relationship between ICT use and JS. Therefore, an interactive effect between ICT usage and job design is hypothesized.

In their study, Day and colleagues [24] propose that: 'the extent to which ICT demands exist in organizations and elicit a strain response in employees may be influenced by the extent to which the organization frames and support employees' use of ICT' [24: 476]. In other words, authors propose a relationship between ICT and 'organization frames', thereby suggesting that the effect of ICT on employees' outcomes may also be affected by organizational elements [25]. As previously reported, a number of studies have proved the relevance of job design for employee's JS. According to this stream, we believe that an interaction exists among ICT use and task characteristics, which may have an interactive effect on job satisfaction. Hence, we suggest that:

- HP3. Task characteristics moderate the relationship between ICT use and JS.

The figure below summarizes our model of analysis (Fig. 1).

## 3 Empirical Analysis

### *3.1 Method*

The empirical research was based on data gathered from the database of the fifth European Working Conditions Survey (EWCS), which was conducted in 2010 on a large sample of workers from the EU35 and which is the most recent one at disposal. Only people who declared their status of being employed were included in

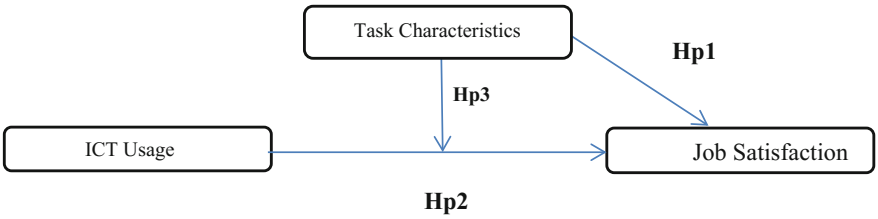


**Fig. 1** The model of analysis

the analysis for the purpose of our analysis. The final sample resulted composed by 35,187 individuals. The EWCS sample is representative of those aged 15 years and over who are in employment and resident in the 35 EU countries. In each country, a multistage, stratified random sampling design was used.

## *3.2 Analysis and Results*

In order to identify the fundamental dimensions of job design as well as the ICT use, an exploratory factor analysis (EFA) was performed on the 21 items chosen from the survey questionnaire. Factors were extracted using the principal component method. Based on previous scales validated in current literature such as JDS [35] WDQ [3] and JCQ [7], relevant items about job characteristics and ICT usage were identified among the set of questions of the EWCS.

The Keiser criterion was used to select the total number of factors (7) guaranteeing a percentage of cumulative explained variance of 59%. Bartlett's sphericity test ($p$-value < 0.001) and the Keiser Meyer Olkin index (KMO = 0.749) were then calculated to check the appropriateness of factor analysis and the sampling adequacy. We conclude that each of them was very good. Then, a varimax (orthogonal) factor rotation was performed to make factor interpretation more reliable. In the end, from the 21 questions, seven factors emerged. In detail, six were related to job design dimensions and one to the 'ICT use' (factor number 4, Table 2).

In order to test the hypothesis presented in this paper, an OLS regression analysis was performed among the main variables.

JS was considered as the dependent variable of the study; it was measured though a single-item-scale that is: 'On the whole, are you very satisfied, satisfied, not very satisfied or not at all satisfied with working conditions?' The responses were based on a five-point-scale ranging: 5 = Strongly agree; 4 = Agree; 3 = Neither agree nor disagree; 2 = Disagree; 1 = Strongly disagree.

Though some authors advice caution in using single-item scales in empirical research [36], others favour the use of this approach [e.g., 37]. Indeed, it has been demonstrated that 'single-item measures of overall job satisfaction correlated highly with multiple-item measures of overall job satisfaction' [37: 77] and might be used in special circumstances [36].

**Table 2** Obliquely rotated component loadings for 21 survey items

| | Components | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Able to choose or change methods of work | 0.812 | | | | | | |
| Able to choose or change order of tasks | 0.786 | | | | | | |
| Able to choose or change speed or rate of work | 0.783 | | | | | | |
| Able to apply own ideas in work | 0.444 | | 0.412 | | | | |
| The job involves complex tasks | | 0.663 | | | | | |
| The job involves learning new things | | 0.643 | | | | | |
| Tasks require different skills | | 0.599 | | | | | |
| The job involves solving unforeseen problems on your own | | 0.595 | | | | | |
| The job involves assessing the quality of own work | | 0.534 | | | | | |
| Having the feeling of doing useful work | | | 0.819 | | | | |
| Job gives you the feeling of work well done | | | 0.802 | | | | |
| Know what is expected of you at work | | | 0.710 | | | | |
| Work with computers. | | | | 0.921 | | | |
| Job involve using internet/email | | | | 0.916 | | | |
| Pace of work dependent on numerical production targets or performance targets | | | | | 0.758 | | |
| Pace of work dependent on automatic speed of a machine or movement of a product | | | | | 0.668 | | |
| Pace of work dependent on the direct control of your boss | | | | | 0.601 | | |
| Pace of work dependent on direct demands from people | | | | | | 0.849 | |

(continued)

**Table 2** (continued)

| | Components | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| Job involves dealing directly with people (not employees) | | | | | | 0.810 | |
| Immediate supervisor provides with feedback | | | | | | | 0.765 |
| Immediate supervisor is good at planning and organizing the work | | | | | | | 0.755 |
| Eigenvalues | 2251 | 2091 | 2038 | 1856 | 1526 | 1484 | 1237 |
| Percentage of total variance | 10,718 | 9956 | 9703 | 8838 | 7268 | 7068 | 5891 |
| Number of text measures | 4 | 4 | 3 | 2 | 3 | 2 | 2 |

*Note* Loadings $\geq 0.40$

The independent variables related to work design dimensions are the six factors emerging from the EFA, that was previously performed (see Table 2). These are: autonomy (AU; factor 1), skill variety (SV; factor 2), task significance (TS; factor 3), work control and formalization (WF; factor 5), dealing with others (DO; factor 6), and feedback from agents (FB; factor 7). As differently from the previous model of Hackman and Oldham [1], task identity was not identified as a factor. Instead, we recognized a fifth dimension that is 'work formalization' (factor 5) which might also be slightly related to the other dimension that is missing in this model—compared to the one by Hackman and Oldham [1]—that is feedback from the job.

The moderation variable of the model, that is 'the use of technologies' at work, emerges by the factor 4 in the CFA, as shown in Table 2.

In order to test our hypothesis, we first introduced six control variables, as they have been identified in the extant literature as relevant drivers for JS (sex and age of respondent, dimension of the firm the individual is employed in, years in the organization, the number of subordinates, average numbers of hours worked per week). In the second step of the model, the factors emerging from the job characteristics were introduced. In the third step, the 'ICT usage' was included. We later incorporated in the model the multiplicative terms computed by multiplication of all the six independent variables related to job characteristics with ICT use (Table 3).

The regression analysis first shows interesting results about the relationship between the task's characteristics and the dependent variable, i.e. JS. Indeed, a significant increase in the overall variance of the model ($R^2 = 0.137$) was found. The results show that all the factors—except dealing with others ($\beta = -0.001$; $p > 0.05$)—affect JS. A positive and significant relationship was found between autonomy ($\beta = 0.143$; $p < 0.001$), skill variety ($\beta = 0.082$; $p < 0.001$), task significance ($\beta = 0.231$; $p < 0.001$) and feedback from agents ($\beta = 0.162$; $p < 0.001$) with JS. A negative and significant relationship was found with work formalization ($\beta = -0.122$; $p < 0.001$).

Our first findings demonstrate that work characteristics have a significant and relevant role in explaining JS.

Furthermore, the positive relationship between JS and ICT use was demonstrated.

In the end, we found that a moderation effect exists for three of the six task characteristics: autonomy, work formalization and dealing with others. Hence, when ICT usage increases, the relationship between autonomy and JS becomes weaker ($\beta = -0.015$; $p < 0.05$) as well the relationship between work formalization and JS ($\beta = -0.026$; $p < 0.01$) and furthermore, when ICT use increases the relationship between dealing with others and JS becomes stronger ($\beta = 0.031$; $p < 0.001$).

In Figs. 2, 3 and 4, the results are presented through three path diagrams.

The interaction effect between variables is evident. When the variable of dealing with others is involved (see Fig. 2) we notice that the positive relationship between ICT use and JS becomes stronger when a high degree of dealing with others is considered in the job position. In this case, it might be worth for positions implying higher levels of ICT use to consider implementing the aspect of dealing with others.

**Table 3** Hierarchical regression analysis for variables predicting job satisfaction (N = 35.187)

| Variable | B | SE B | β | | B | SE B | β | | B | SE B | β | | B | SE B | β | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Sex | 0.019 | 0.013 | 0.013 | | 0.038 | 0.012 | 0.027 | ** | 0.058 | 0.012 | 0.041 | *** | 0.060 | 0.012 | 0.042 | *** |
| Age | 0.000 | 0.001 | −0.008 | | 0.001 | 0.001 | 0.013 | | 0.000 | 0.001 | 0.001 | | 0.000 | 0.001 | 0.001 | |
| Number of people in the workplace | −0.010 | 0.004 | −0.024 | ** | −0.019 | 0.004 | −0.046 | *** | −0.010 | 0.004 | −0.024 | ** | −0.009 | 0.004 | −0.021 | * |
| Years in the organization | 0.000 | 0.001 | −0.004 | | 0.001 | 0.001 | 0.019 | . | 0.002 | 0.001 | 0.027 | ** | 0.002 | 0.001 | 0.026 | ** |
| Number of subordinates | 0.000 | 0.000 | −0.008 | | 0.000 | 0.000 | −0.009 | | 0.000 | 0.000 | −0.007 | | 0.000 | 0.000 | −0.007 | |
| Average hours worked per week | 0.009 | 0.001 | 0.134 | *** | 0.008 | 0.001 | 0.117 | *** | 0.008 | 0.001 | 0.122 | *** | 0.008 | 0.001 | 0.121 | *** |
| Autonomy (AU) | | | | | 0.102 | 0.006 | 0.143 | *** | 0.101 | 0.006 | 0.141 | *** | 0.100 | 0.006 | 0.140 | *** |
| Skill variety (SV) | | | | | 0.059 | 0.006 | 0.082 | *** | 0.061 | 0.006 | 0.085 | *** | 0.061 | 0.006 | 0.085 | *** |
| Task significance (TS) | | | | | 0.165 | 0.006 | 0.231 | *** | 0.165 | 0.006 | 0.231 | *** | 0.165 | 0.006 | 0.231 | *** |
| Work formalization (WF) | | | | | −0.087 | 0.006 | −0.122 | *** | −0.086 | 0.006 | −0.121 | *** | −0.082 | 0.006 | −0.115 | *** |
| Dealing with others (DO) | | | | | 0.003 | 0.006 | 0.004 | | 0.002 | 0.006 | 0.003 | | −0.001 | 0.006 | −0.001 | |
| Feedback from agents (FB) | | | | | 0.115 | 0.006 | 0.162 | *** | 0.114 | 0.006 | 0.161 | *** | 0.114 | 0.006 | 0.161 | *** |
| ICT usage | | | | | | | | | 0.093 | 0.006 | 0.131 | *** | 0.092 | 0.006 | 0.129 | *** |
| ICT*autonomy | | | | | | | | | | | | | −0.011 | 0.006 | −0.015 | * |
| ICT*skill variety | | | | | | | | | | | | | −0.002 | 0.006 | −0.002 | |

(continued)

**Table 3** (continued)

| Variable | B | SE B | β | | B | SE B | β | | B | SE B | β | | B | SE B | β | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ICT*task significance | | | | | | | | | | | | | 0.001 | 0.006 | 0.001 | |
| ICT*work formalization | | | | | | | | | | | | | −0.019 | 0.006 | −0.026 | ** |
| ICT*dealing with others | | | | | | | | | | | | | 0.022 | 0.006 | 0.031 | *** |
| ICT*feedback from agents | | | | | | | | | | | | | 0 | 0.006 | 0 | |
| $R^2$ | | 0.018 | | | | 0.137 | | | | 0.154 | | | | 0.155 | | |
| F | | 4.201 | *** | | | 175.01 | *** | | | 184.2 | *** | | | 127.68 | *** | |

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

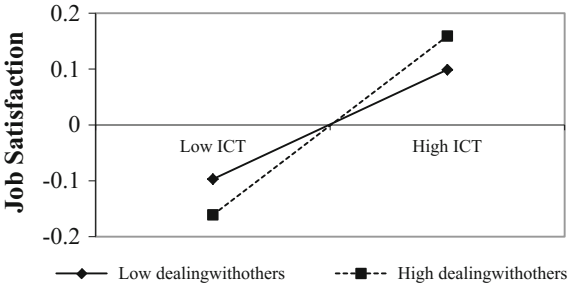


**Fig. 2** The graphical representation of the moderation effect of dealing with others on the relationship between ICT usage and job satisfaction

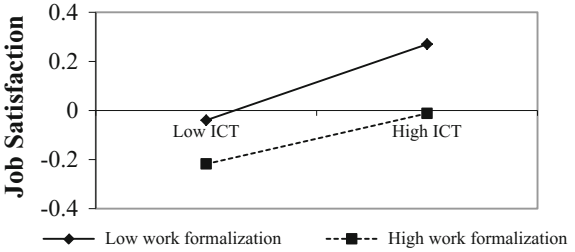


**Fig. 3** The graphical representation of the moderation effect of work formalization on the relationship between ICT usage and job satisfaction

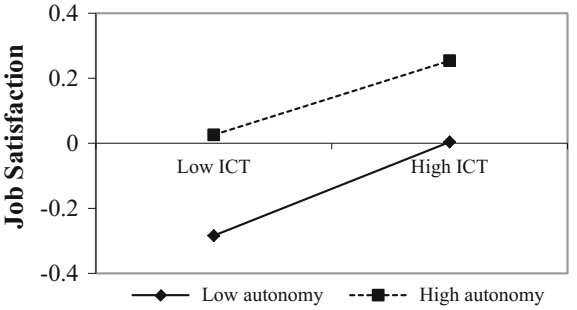


**Fig. 4** The graphical representation of the moderation effect of autonomy on the relationship between ICT usage and job satisfaction

For work formalization we see a sort of 'conflict' between the two dimensions, so that when both of these—work formalization and ICT usage—have a high level there is a negative impact on JS, implying that when there is a high ICT use, it is worth reducing the work formalization. Finally, we found that when autonomy is