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The Italian Association on Information Systems and this conference

ItAIS (www.itais.org) was established in 2003 as the Italian Chapter of the Association for Information Systems (AIS - www.aisnet.org) and has since then been promoting the exchange of ideas, experience, and knowledge among both academics and professionals committed to the development, management, organization and use of information systems.

The itAIS conference is the major annual event of the Italian Information System community and it is thought as a forum to promote discussions and experiences exchanges among researchers in the field, both from the academy and the industry. Being the current the eleventh edition, in 2016 itAIS was held in Verona. The previous editions took place in Rome on 2015, Genova on 2014, Milan on 2013, Rome on 2012 and 2011, Naples on 2010, Costa Smeralda on 2009, Paris on 2008, Venice on 2007, Milan on 2006, Verona on 2005, and again Naples on 2004.

itAIS 2016 aims to bring together researchers, scientists, engineers, and doctoral students to exchange and share their experiences, ideas, challenges, solutions, and research results about all aspects related to the impact of Information Technology and Innovation Trends in Organizations. The conference includes 16 tracks: (1) Organizational change and Impact of ICT; (2) Accounting Information Systems; (3) Advanced ICT support for innovation strategies, management, and implementations; (4) Human-computer interaction; (5) Continuous Redesign of Socio-Technical Systems; (6) Digitalization trends in Human Resources Management; (7) e-Services, Social Networks, and Smartcities; (8) ICT-enabled innovation in public services: co-production and collaborative networking; (9) The new era of digitalization in Healthcare and Public sector; (10) IS (lost) in the Cloud; (11) Internet of Things: exploring tensions in global information infrastructures; (12) Technology-enhanced learning: transforming learning processes in organizations; (13) Supply Chain Resilience and Security; (14) Digital Marketing and Analytics.

The participation success that has been registered in the previous editions is confirmed this year. The conference attracted more than 80 submissions from Italian and foreigner researchers. Among them, more

than 68 contributions have been accepted for presentation at the conference following a double-blind review process. Among them, 19 are published in this book, the other will appear in a volume of the Springer Series *Lecture Notes in Information Systems and Organisations*[1].
The conference took place at Economics Department, University of Verona (Santa Marta campus) on October 7th – 8th, 2016 and is organized in 5 parallel sessions.

We would like to thank all the authors who submitted papers and all conference participants. We are also grateful to the chairs of the fourteen tracks and the external referees, for their thorough work in reviewing submissions with expertise and patience, and to the President and members of the itAIS steering committee for their strong support and encouragement in the organization of itAIS 2016. A special thanks to all members of the Organizing Committee for their precious support to the organization and management of the event and in the publication of the enclosed proceedings.

The Book Proceedings editors
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Implementing Enterprise System in Large State-owned utilities: A case study

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Abstract. Enterprise systems, if planned effectively and implemented resourcefully, can improve the efficiency of an enterprise to a great extent. However, implementation of enterprise software in large public sector corporations is fraught with risks and challenges. These challenges include supporting infrastructure, human issues, change management, base-technologies, software integration, etc; the least of which is technology. In fact we aim to highlight non-technical factors in this regard such as management support, user buy-in, change management, fear factor, etc. Our research presents a case study which aims to share the experiences of implementing enterprise systems in a large state-owned gas utility, Sui Northern Gas Pipelines Limited (SNGPL). SNGPL stretches over 15 regions and serving around 5.2 million consumers in northern Pakistan. This paper presents non-technical challenges faced by SNGPL and the ways SNGPL opted to deal with them.

Keywords: Enterprise Resource Planning, ERP Implementation, Information Systems, Public Sector Gas Utility, SNGPL.

1 Introduction

In today's world of global computing, we have seen substantial adoption of Information Systems (IS) by organizations throughout the world [1, 11, 46, 51]. Organizations are implementing enterprise systems, like ERP, to gain competitive advantages.

ERP is a multi-module application software that supports a broad set of functions including purchasing, stores, sales, distribution, accounting, billing, and customer service [36]. Successful implementation of enterprise systems enables the organization to gain tangible and intangible benefits in diverse areas [12, 13, 26]. However, not all organizations reap the eventual benefits of implementing enterprise systems they aim for, while investing substantial time and effort [6-8]. Governments allocate significant budgets to build infrastructure in order to support reliable and efficient management information systems. Various organizations allocate huge amounts on IS to provide better products and services to end-users [46]. Nonetheless,

the success of implementing these IS requires a change in the associated work practices and a redesign of manual/legacy systems which play a vital role in achieving success.

Although the benefits accrued due to enterprise systems are tremendous, not all organizations are willing to adopt them. Some organizations either discontinue ERP implementation or terminate them after adoption [6, 12]. Not all ERP implementations are successful [8]. According to research almost 50% to 75% of the ERP implementations do not fulfill requirements of organization [23,27,38] and 60% to 90% of ERP implementations fail altogether [2,37,49]. Studies also show that 90% of successful ERP projects overrun both the defined timeline and allocated budgets [4, 35,37]. In most cases the top management realizes midway through ERP implementation that it is not suitable. By this time, however, it is too late to step back. Hence, it is necessary to know the key success and failure factors of ERP implementations beforehand. Because of the high failure rate, it is necessary to share the success and failure factors that can help in successful ERP implementation [40,43]. This research presents a case study of successful implementation of enterprise systems in a large state-owned gas utility – SNGPL. It is expected that our research will provide support to organizations across the globe for successful implementation of ERP in state-owned large utilities.

2 Literature Review

Public utility companies implement enterprise systems to track revenue and resource information, monitor expenditures, and provide up-to-date information to each concerned department so that they can serve the public better [7]. Enterprise systems provide an integration point to all enterprise applications to make a central data repository so that it can be accessed with ease by all concerned stakeholders [5]. There are a number of key factors that must be addressed for successful implementation of enterprise systems. More specifically, information Systems implementation challenges have been investigated [15,25].

The integrated systems provided by IT have resulted in more complex organizational structures [19, 20] that consequently increase the risk of implementing integrated IT infrastructures [6]. Therefore, ERP implementation risks and their mitigation form key challenges for organizations.

Different approaches have been adopted to study enterprise system implementation. These studies have identified top management, business objectives, leadership perspective, organization culture, etc. as major influencing factors while implementing enterprise systems [17,24,34,41].

According to Wagle [48] strong leadership and critical eye to budget are the two key success factors for successful implementation. In this regard Upadhyay [33] and Chen [10] have identified success factors including definition of clear implementation goals, user training, experienced implementation team and vendor support.

V. Kumar [47] has identified sufficient data, training and testing, holding experienced resources, customization and clear management objectives as key factors

in enterprise systems implementation in fertilizer industry. Top management support and clear goals & objectives are also prioritized as the two most important success factors in ERP implementation [32]. Y.Mohmed [29] has identified eight important critical success factors for successful implementations. These include commitment and support of top management, project management, user training and education, business plan and vision, technological infrastructure, departments (stakeholder) participation, change management and communication.

Business Process Reengineering (BPR) usually slowdowns the implementation process of enterprise systems. However, companies having richer experience in Business Process Reengineering and process management usually implement enterprise systems more efficiently and successfully [21]. BPR invokes business processes redesign [12,14] and forms a bridge with the legacy systems [3]. An Enterprise system is for the entire organization; therefore, BPR should be done before implementing enterprise systems. However, since BPR affects the whole organization and it is difficult to revert the changes done in business processes, this may lead to the failure of entire organization (as organization may become more dependent on ERP system) [18,50].

A number of risk factors are associated with an ERP implementation. Samantha [3] has identified lack of top management support, inadequate internal staff, scarce end user training and change resistance as major risks while implementing an ERP project. Risk management must be done beforehand so that the risks may not become issues subsequently [42].

Enterprise systems implementation failure ratio is relatively high [23,27,38]. Some of the major failures of ERP implementations include Sony Germany, FoxMeyer Drug's ERP system, Russ Berrie and Corporations (3-year failed implementation), Nike's supply chain issues, HP's North American SAP system, General Motor's locomotive division and many more [44].

One of the major factors of failure is to consider the ERP implementation to be mere automation. It must be kept in mind that implementing enterprise systems is a complete change management process; it provides a complete business solution rather than just automation [16]. Over-customization is also one major reason of project failures [16]. Few failures causing crucial mistakes include assigning team members just because they are the only available members, training of selected team members and expecting them to train the rest by knowledge sharing and ineffective communication of project progress [18]

It is necessary to consider all major success and failure factors while implementing enterprise systems. Most large organizations in Pakistan have either implemented enterprise systems or are struggling to do so. Because of the differences in Pakistani culture as compared to the cultures where ERP systems are implemented, ERP implementation is considered particularly challenging [30]. ERP systems have a huge market in Pakistan [48]. However, limited literature can be found related to implementation, case studies and challenges faced by various companies in Pakistan [22,30,31]. These have not been documented to a great extent. This scenario raises the importance of documenting the ERP implementations in Pakistani culture and organizations as emphasized in prior literature [30,31,39].

In this paper, we share implementation experience of enterprise system in SNGPL (the largest gas utility in Pakistan); the challenges and issues faced throughout the implementation cycle. It is believed that SNGPL has been a success story of implementing ERP on time and under budget. Sharing of our successful ERP implementation experience will be encouraging, not only for the regional Asian countries, but also around the globe as well. In our study, we have stated our experiences regarding how we have coped with the ERP implementation challenges; so that the organizations may take them into consideration while implementing enterprise systems and take necessary measures beforehand. A similar presentation of the case study has been made in The Customer Show [45]. Conclusively, SNGPL has successfully faced the challenges and adopted efficient strategies to mitigate the risks.

3 Case Study

3.1. SNGPL

Sui Northern Gas Pipelines Limited (SNGPL) is the largest integrated gas transmission and distribution company serving more than 5.2 million consumers in North Central Pakistan through an extensive network in the area. It is certified against ISO 14001:2004 & OHSAS 18001:2007 Standards. The 15 regions of SNGPL have been registered under the PAK-EPA's "SMART2" Program. The Company has over 50 years of experience in operation and maintenance of high-pressure gas transmission and distribution systems. It has also expanded its activities as Engineering, Procurement and Construction (EPC) Contractor to undertake planning, designing and construction of transmission and distribution pipelines, both for itself and other organizations.

The largest gas utility in the region has over 5.2 million consumers comprising Commercial, Domestic, General Industry and Fertilizer Power & Cement Sectors. Before implementing ERP, the company was using a legacy system since 1982. The legacy system was based on batch processing that was isolated and limited to billing department only. Moreover, there were usual delays in first bills, bill corrections, transparency, etc. Because of obsolete hardware and software the integration of legacy system with newer system was quite difficult. It was quite complicated to maintain and upgrade the legacy system. The management decided to develop state-of-the art Centralized Customer Care and Billing (CC&B) Information System with a 360° customer view via complete process automation across the board by proper data capturing and ownership at each level of the business processes.

3.2. Objectives

The Enterprise system was implemented in SNGPL with the objective of improving the legacy Billing system by following "Industry best practices" to achieve efficiency, productivity and quality in all operations. The main objectives were to increase profit by decreasing operating cost, integrate sophisticated call centers using modern technologies, achieve process ownership, business processes integration, elimination

of stand-alone and legacy systems, improving back-office services, reduce time to implement new modules, integration with ERP, GIS and Smart metering, elimination of manual processes and paper trail, achieving higher stakeholder values and satisfaction and improvement and fulfillment of internal and external reporting (Management, Ministry and the regulator).

3.3. Project Organization

Oracle provided enterprise systems implementation services at SNGPL. The CC&B system was implemented across the board in 8 departments i.e. Sales, Customer Services, Billing, Distribution, Accounts, IT, Procurement and Stores. The SNGPL internal implementation team consisted of approx 60 resources, 1200 Business Users and supported by a modern data center based on IBM power 6 machines.

The management approved the implementation of Customer Care & Billing enterprise system in SNGPL using a Big Bang approach. It was a hard task with such limited resources and limited technology. However, our enthusiastic team took the initiative and started ERP implementation activities with zeal and vigor under the proper project organization.

The Executive Sponsor of the project was the Managing Director (CEO) of SNGPL while CFO and distribution heads were the Project Sponsors. Steering Committee included SNGPL (CFO, CIO, Project Director) and Oracle (VP Consulting, Project Director and PM) were the key personnel.

The SNGPL core team consisted of the Project Director (PD) and Project Manager (PM). PM reported to PD. Further, under the umbrella of PM were 3 important teams i.e. Technical Team, Functional Team and Business Leads. The Technical Team reported to the PM. Oracle team structure included Project Manager and Senior Solution Architect, both reported to Oracle Project Director. Further, Designer reported to Business Architect and Business Architect to Senior Solution Architect. There was a coordinator between the Project Managers of Oracle Team and SNGPL core team for coordination purposes.

3.4. Implementation Methodology

enCompass implementation methodology [28] was used for implementing enterprise systems. The motivation of enCompass methodology was to deliver the project on time, on budget and to address the business process needs. Based on a philosophy of plan, prepare, do, SNGPL used the enCOMPASS methodology and identified six strategic phases of the project lifecycle i.e. Initiation, Analysis, Assembly, Acceptance, Rollout and Post Implementation Services. The duration of each of these phases is stated in Table 1. The project took seventy-three weeks in total. The initiation phase took 8 weeks whereas Analysis and Assembly took 15 and 16 weeks respectively. 14 weeks were consumed by UAT and 12 by Rollout. Finally, Post Implementation Service took 8 weeks to complete.

Table 1. Project phases duration

Sr. No.	Phase	Duration
1	Initiation (Kick-off, Project Charter)	8 Weeks
2	Analysis (System Study, AS-IS, TO-BE)	15 Weeks
3	Assembly (Development & Configuration)	16 Weeks
4	User Acceptance Testing	14 Weeks
5	Rollout (Move to Production)	12 Weeks
6	Post Implementation Service	8 Weeks

3.5. Issues and Challenges

Implementing enterprise systems in such a huge company is a critical task. Besides usual implementation challenges of enterprise systems, implementing enterprise systems in SNGPL brought numerous specific critical challenges. In this research we only focus on non-technical challenges. The foremost pre-implementation challenges included user buy in, change management, management commitment, capacity building and timely provision of resources, information and sign-offs. Moreover, major post-implementation challenges included non-acceptability of the system, unwillingness to work, excuses of non-availability of equipment including printers, electricity, staff shortage, etc. and commitment of regional management.

In addition, we faced numerous change management issues. These issues can become show-stoppers if they are not addressed and mitigated properly. People were actually afraid of losing their jobs and were reluctant to participate in the various stages. We made a proper action plan against the change management issues. These issues included confinement in comfort zones, change resistance, process ownership and comprehension and absorption, etc. An action plan was prepared and executed accordingly. The main strategy of the action plan included broadcasting, higher management endorsements, produce champions of the change, capacity building and inject fresh resources. Moreover, a periodic status report was prepared to discuss project progress.

Besides change management issues, the administrative and logistics issues were considerable. These included human resource issues, infrastructure (PCs, printers, networks, etc.) issues and electricity/power (generators) issues during implementation of enterprise systems. Departments were reluctant to give their best people to the project.

The business ownership challenges were to redefine workflows, provide user friendly interfaces, develop new reports, and reconciliation. Furthermore, SNGPL was operating on legacy system for the past 25 years so data migration was a huge challenge. A number of data migration runs were carried out by the migration team. This generated a number of issues regarding missing and incomplete data. After a few iterations, the migration and cut off strategy was finalized. Unlike other similar projects elsewhere no provisional billing was carried out.

To overcome software configuration issues, new report requirements with changed business processes, reconciliation and optimizing technology stack (server machine, database server and application server) were also highlighted as major challenges.

Huge budget approvals was also a major challenge. Ministry and the regulator are often reluctant to risk huge investments and demand detailed analysis of tangible benefits, etc. beforehand. Moreover, payment mechanisms are archaic and bureaucratic, hence vendors feel frustrated. This is a direct consequence of being a state owned company.

The culture of a state-owned utility also inculcates some specific challenges. The biggest of these is the "Baboo-Culture" or "Officer" mindset of the employees. The officers were often reluctant to go to others desks by themselves for the relevant junior staff to perform simple tasks, leading to delays and interruptions.

3.6. Strategy

The most important strategy SNGPL adopted to mitigate the risks was to “Get business on board as early as possible” both in planning and pre-implementation phases. Acquiring the best resources from business was a challenge. There were frequent comments from business that in order to improve our future we cannot sacrifice our present. However, deploying the best resources from business as focal persons helped the implementation. It is important to make sure that all required resources should be on board before initiating the project implementation. The project must not appear as being imposed on the users. Rather they should feel that they are driving it and take ownership. One of the most crucial points is to deal with change management effectively. For this, communication is the key to success. Start building the change management with project kick-off.

Weekly status meetings were held throughout the project implementation cycle where issues and challenges were discussed and agreed upon. These meetings became so regular that no formal requests were made to attend. Every issue was documented and decision was circulated at the end of the meeting. Crucial decisions were dealt with by the Steering Committee.

Implementation of enterprise system in clearly defined small phases was an important factor towards the way of success. Each phase must had some outcome(s) that became the input to the next phase. We developed the project reports as early as possible for analysis. For risk analysis and risk mitigation, we tried to acquire efficient and experienced resources. However, we used a mix of experienced and fresh resources in all major phases of project implementation. Nonetheless, the project implementation team had experienced resources. Basically, we followed a deliverable based approach at the end of each major phase and marked a clear benchmark for the closure of each phase.

It was ensured that documentation was meticulously maintained therefore, each phase was properly tracked with required set of documentation that included relevant calculation methods and policies. Project closure must be defined clearly and unambiguously so we defined clear project closure boundaries along with each phase closure points.

The top management commitment is critical in the successful implementation of projects. In this particular case, our management motivated us throughout the project implementation and stood with us in all crucial situations. Moreover, continuous resource motivation is very important for achieving success. We provided financial Incentives and counselling to all the resources that were part of the enterprise system implementation. The monthly newsletter was used to encourage people by including their pictures and comments in the newsletter.

End user training always plays a key role in success. Training manuals were meticulously prepared and circulated. Each process was separately documented using swim lane diagrams and screenshots, etc. In our training institute, SNGTI (Sui Northern Gas Training Institute), we arranged comprehensive trainings for the end-users to prepare them for change. After the training sessions sample tests were conducted and record was kept. In the end, project stabilization takes times – so win the confidence of business from beginning to end.

3.7. Benefits Realized

By following the above stated strategies, finally we were able to provide live online access to our implemented enterprise system. The project implementation was on time and under budget. Initial acceptance after go live was not very encouraging and most of the issues which were fairly standard IT issues were brought up. These issues were attributed to deficiencies in the system whereas most of these were related to change management and new ways of thinking.

A major benefit of implementing the enterprise system is process visibility. In the legacy system most steps were either manual or not visible to the various stakeholders in the system. With the adoption of the new system nothing remained “invisible”. This generally makes people feel uncomfortable and there is no hiding behind paper work. This being one of the biggest challenges has in fact turned out to be an equally important benefit.

The Customer Care and Billing System has improved our customer focus and complaint management. Moreover, it has reduced time to first bill, enhanced process visibility, and eliminated pass-the-buck approach. It has provided accountability at each stage of the business process. There is a single point of data entry and retrieval and nothing remains under the carpet. The enterprise system integrates sales, customer services, stores, and distribution departments, etc. In the end we feel that SNGPL has achieved significant improvements in turn round time, customer satisfaction, etc.

4 Conclusion

SNGPL has implemented the enterprise system with the focus of improving efficiency, productivity and quality in all operations. While implementing ERP, we faced numerous critical challenges. Top management provided full commitment and support towards the project and it has been acknowledged as one of the most crucial factors towards successful implementation of enterprise systems in SNGPL. The key

responsibility of top management is to provide adequate funding and efficient resources for successful implementation, however, the importance of suitable vendor, proper hardware and software cannot be overstated.

Other factors contributing to success that need to be addressed include defining clear goals and objectives, control of top management, expectation management, change management, effective communication among all stakeholders, administrative and logistics issues, software configuration issues, etc. All of these factors must be considered throughout the implementation of the project.

We have followed a well-organized approach in all phases of the project implementation. A proper implementation methodology was used to define project phases, key activities of phases and their duration. All the phases had a well-defined beginning and a clear end-point. A number of strategies were made to overcome the issues and challenges stated earlier. Deploying the best resources from business as focal persons reduced the complexity of the implementation. Weekly status meetings helped to control numerous change management issues. For risk mitigation we used a mix of fresh and experienced resources. Continuous resource motivation was also another factor in project success. Documentation of each phase was maintained with clear defined closure boundaries.

The result is a project that was on time and within budget. Process visibility is one major benefit of implementing enterprise systems in such a huge organization. The organization improved the turn-around time significantly. Finally for the successful implementation of enterprise system, the team should have a positive approach towards goal achievement. In today's world of technology, enterprise systems are not a mere automation of existing business processes but they transform and play significant role in the success of an organization.

This research has reiterated and corroborated the findings presented in the literature review such as change management, management commitment, user buy-in, fear factor, etc. These findings highlight and support the notion that successful implementation of ERP systems in large organizations is fraught with risks and challenges. These need to be addressed before, during and after implementation. Moreover, this report has filled the gap regarding implementation challenges faced by similar organizations within the region.

While we continue to address the issues and challenges, we plan to measure and monitor the success of the implemented information systems based on factors such as system & information quality, usability, individual & organizational impact and service quality etc.

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Pharmacist Resistance to PBM System in a Developing Country

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Abstract. The online Pharmacy bnefit management (PBM) has been of a major interest recently due to the interest in the health care sector to cut off expenses and reduce costs. However, unless pharmacies incorporate the use of PBM in their system, the benefits will not appear. This research aims at presenting a theoretical model of pharmacist resistance of the online use of pharmacy benefit management (PBM) in developing countries by integrating the resistance to change, risk and technology acceptance literatures. This research proposes a model to investigate the relationship and effects of users' resistance of online PBM usage and the enabling perceptions. This study shows the significance of integrating the user's resistance in technology adoption research in general and the Pharmacy Benefit Management research in particular and attempts to provide a preliminary model that is expected to be tested on a larger scale in the future by using a survey data from a large sample of pharmacists . Addressing this gap in knowledge is very crucial for practitioners and scholars as well, to enhance their understanding of ICT adoption in the healthcare industry which may help them to bring e-healthcare in developing countries a step further.

Keywords: ICT. TAM model, Resistance, Risk factors, Pharmacies, healthcare

1 Introduction

For the last decades, Information technology had proven to be having a major impact on most of the industries. Many industries have adopted ICT use to streamline their operations and leverage the potential benefits that this new economy could bring to their businesses. Thus, the emergence of pharmacy benefits management system (PBMs) represents an important strategic revolution that had been seen in the pharmaceutical industry since the 1990s. Pharmacy benefit management today, offers a range of services that are tailored to affect the outpatient prescription medicine use and costs savings. However, the use of ICT in pharmacies is usually resisted by the same users that are supposed taking advantage of using it. Undoubtedly, and given the expected potential advantages and benefits when this system is being adopted by the healthcare providers and more specifically by pharmacies, there are still many potential users that are still underestimating what this system could offer and resist to using it and integrating it in their work process.

The use of the Information and Communication Technology in the health care system in developing countries could bring many potential advantages. It could enable the storage of structural patient's records, facilitating the prescription and buying/selling process, automate the medicine bills and delivery in the supply chain and most importantly controlling the efficiency and efficacy of medicine use and improve the patient's safety as well. A large number of pharmacists are already using ICT to support their daily routine tasks and, when considering the IT necessities for their daily working practices, pharmacists should take into consideration what are the best systems to use.

This research aims at investigating the adoptions of ICT use in the health care system and more specifically by pharmacists. Therefore, we attend to investigate the following major questions:

- Why do many pharmacies resist adopting the PBM
- How does this resistance influence their adoption and use?

Addressing this gap in knowledge is very crucial for practitioners and scholars as well, to enhance their understanding of ICT adoption which may help them to bring e-business adoption a step further.

From a practitioner's perspective, understanding why pharmacists resist in adopting the online PBM system and how this resistance is visible in their attitude could possibly assist healthcare managers implement rigorous strategies

for reducing pharmacists' resistance in adopting it. This is vital as previous studies in healthcare system have indicated that traditional change management practices are limited in justifying the user's resistance. While in Lebanon, a growing number of local pharmacies are moving to the online platform to facilitate their processes and activities but still, and most of those pharmacies, are partly or almost not active online at all (escwa.un.singorg, 2009).

From a theoretical perspective: First, though there has been significant research on different e-health care issues in developed and developing countries, it is still not comprehensible if the knowledge attained from these research studies could be applied in the context of the online PBM adoption system or for the context of a developing country. This is due to the lack of sufficient legislation in e-business and the nature of this market that differentiates it from others, whether in the cultural, economic or geographical aspects.

Second, previous research concerning the IT use has mostly disregarded the importance of the user resistance in parallel with the behavior models or has been limited. We have to note at this stage that resistance does not necessarily concern the non-users only. Non users could be simply non-users that are unaware of the innovation or are still evaluating the innovation before adopting it. Usually, when people are resistant to change or to any type of innovation, their behavior is marked with opposition to open hostility toward the change (Freudenheim, 2004), while non-users does not necessarily mean the same.

Therefore, for the propose of our research we aim at examining the intention to use along with the IT resistance behavior among pharmacists as we consider that resistance is a major factor that could influence the online PBM adoption in the pharmaceutical industry. We propose a preliminary model for PBM resistance based

on previous findings and studies that have raised those two subjects in the literature: the information technology use and the resistance by users as the bridge between these the two literatures are interesting (Cenfetelli, 2004).

This theoretical model is expected to be tested on a larger scale by using a survey data from a large sample of pharmacists.

2 PBM system and the Lebanese pharmacies

Pharmacy benefit management (PBM) system has changed over the last two decades from different aspects. It has been used for example for processing firm's claims, mail orders, and a supportive alternative for insurance firms and managed healthcare institutions. The competitive environment and the rising health care costs have again become an important factor that had influenced the healthcare companies to search for a new alternative such as adopting new technology and creating new business models. Gaining control over claims can reduce an insurer's costs significantly. These activities had lead to improve the service quality and cost savings by gaining control over the prescription claims, lowering processing charges and avoiding any waist or uncontrollable orders. Competition in the PBM industry has centered on managing drug benefits on a carved-out basis, independent of other health care services and benefits. Nevertheless, PBM firms expect a promising future role in adopting the role of disease management for chronic disease patients especially those with high cost such as cancer, diabetes and asthma, which would allow them, not only to improve the delivery of health care service to their patients, but also to profit from their constant move once they are loyal to the system.

As a result, the development of an online electronic data interchange capabilities at virtually all retail pharmacies by the end of the 1980s in the United States, such as PBM, was crucial and had brought many advantages to the healthcare economy especially that today it is a very successful integrated system while aging behind despite all the opportunities and possible benefits it could offer. In Lebanon, based on the order of pharmacists site (http://www.opl.org.lb/site/en/index.php ,2016), there are 3999 official pharmacies operating in Lebanon and are spread all over its territories in addition to three third party administrators (Globemed, Nextcare and Bankers) that offer the PBM service on the behalf of insurance companies and the social security stem (in case the patient is registered in both systems).

Patients' data is usually uploaded into the Pharmacy Benefit Management web system by the third party administrator (TPA) to manage their pharmacy programs from their database where the patient can access all related information needed such as predefined list of medication approved and pharmacies that are already adoption the PBM system online.

When the patient presents his prescription to the chosen pharmacy, prescriptions that are presented electronically or manually to the pharmacy, requests are reviewed by TPA experts' network and instantly processed and that is by connecting online to the PBM system and reviewed in real time for eligibility which provides a fast and efficient quality of service to the ensured member. One of the major advantages of

this process is that the TPA provider can identify coverage policy and manage the allowed quantities for each patient in the respective formulary and avoid any waist, duplication or over prescription in addition to time consuming and cutting off expenses by providing less paper work processing. It can integrate patients chronic conditions prescriptions automatically and on a monthly routinely basis into the PBM database. Once the claim is approved, it automatically transfers the amount due to the pharmacy on the behalf of the patient and recollects its bills from the concerned parties such as insurance or Social security providers.

The below figure describes the PBM system adopted in Lebanon:

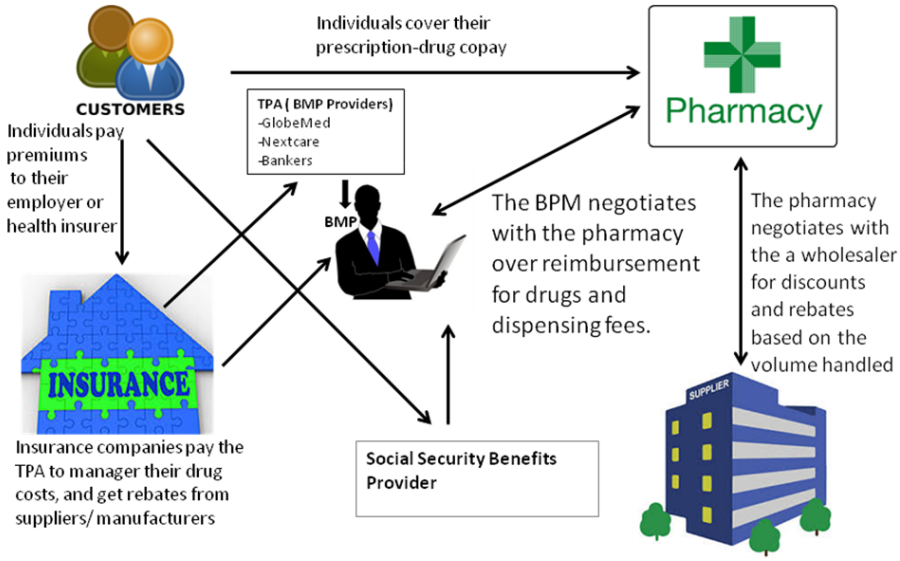

Fig. 1. PBM system process as adopted in Lebanon

3 Previous research

However, there aren't many investigations concerning the behavioral problems related to the online PBM use by pharmacists and their resistance to adopting and integrating it. There have been many studies and scholars that have discussed the role of health practitioners in resisting IT adoption, such as doctors, nurses and employees (Taylor et al., 2002; Mekhijan et al., 2002) but there have been no systematic investigation concerning the pharmacist in resisting or adopting ICT in their daily routine work. Poon et al. (2004) for example, have used the grounded theory to identify factors that could hinder the CPOE implementation in the healthcare domain and more specifically in hospitals. Nevertheless, there hasn't been any study that proposes a theory or a model that concerns the ICT adoption and more specifically the online PBM adoption or resistance.

Nevertheless, in a survey study conducted by Venkatesh & Brown (2001) concerning personal computers adoption, the authors had stated that resistors exceeded acceptors by an important percentage (33% - 67%) and factors that had predicted their resistance were examples such as fear of technological obsolescence, the high cost of technology, and the lack of required knowledge or experience. Furthermore, the relationship between intention to use and behavior was different among the two groups. Parthasarathy & Bhattacherjee (1998) , in a study of people's use of internet access service, observed that those who stopped using the internet service after the promotional trial had ended where dissimilar from the constant adopters in many way : in the service use and in the service perception (ease of use , usefulness and compatibility).

In a research study, Lapointe & Rivard (2005) observed significant evidence of physician resistance into reactions to clinical IT. Hassan et al (2011), identified several factors that affected ICT usage among JKKK members in Malesia. Attitude was identified as the most significant contributor for perceived usefulness towards ICT usage while Perceived Usefulness and Perceived Ease of Use , Self-efficacy , Subjective Norm , explained about 60% of the variance/variation in perceived usefulness towards ICT usage.

The above research studies share the same view when it concerns user resistance as a significant problem for information technology use in general (Venkatesh & Brown, 2001) and more specifically in healthcare (Poon et al 2004). In addition, they imply to resistance as the result of different factors than IT acceptance. Yet, most of those studies were conducted separately and in developed countries, and not for the case of developing country. As we know, developed countries differ from developing countries in terms of services availabilities and facilities. In addition, the results are not necessarily tied to each other.

Perceived risk is another factor that could be considered as a measure that precedes both perceived usefulness and perceived ease in the literature. According to Dowling and Staelin (1994), Perceived risk is a construct of perceived situation that has been described in several ways.

To simplify it further, numerous types of perceived risk have been adopted in several research and defined as follows (Huang et al 2002; Rindfleisch and Crockett, 1999):

- Financial risk that user might encounter in case he intends to use the product
- Performance risk is related to the users fear that the products won't perform as anticipated.
- Physical risk is concerns problems that could arise by using the product such as security issues.
- Psychological risk is related to the user's self image in case the product isn't consistent with it.
- Convenience refers to fear that the users would face when they buy or adopt the service.

Part of the problem may have been the lack of a comprehensive theory of user resistance and risk taking and its lack of grounding within an established stream of research. In the next section, we attempt to build such a theory, while also grounding it in the IT adoption and resistance to change literatures.

4 Hypotheses

The source of one of the most broadly acknowledged psychological models that compels organizational behavior is the idea that there is a resistance to change. This could be traced back to Lewin's (1947) research on force-field analysis in the organizational development literature. Lewin had argued that the social system tends to preserve its actual status by resisting to a new change. Lewin thus argues that it is the organization's responsibility to make the change successful and overcome resistance and that is by changing the actual dynamics and opposing forces prior to changing.

Dubrin & Ireland (1993) treated resistance to change rather differently. They refer resistance to change as a result of three major factors:

-individuals might fear that they would have an outcome that is below their expectations such as earning less money, required to perform additional tasks or efforts.

-individuals might also fear the unexpected and what they don't know which could result in errors in regards of their superiors or other colleagues.

- individuals' fear any potential problem that might arise due to his misuse and inexperience in change.

Based on Zakaria and Mohd Yusof (2001), a culture that tends towards supporting and promoting change, would be more ready to accept the use and implementation of ICT. Much more than a culture encourages steadiness and certainty. Resistance towards using the information and communication technology in the healthcare system could possibly be witnessed if the culture is resistant to change. Similarly, Zaltman & Duncan (1977), described resistance to change as a 'conduct that serves to maintain the status quo in the face of pressure to alter the status quo' (p. 63)

At this point of our research, we may state that all the above views and definitions highlight the importance of the exceptional characteristics of the resistance to change construct and its difference from the information technology acceptance for two major reasons: the acceptance behavior of an innovation is driven by user's perceptions that are related to IT, while resistance is usually against change rather than against IT adoption; Resistance could be understood or a result of a cognitive behavior that affects the potential behavior rather than a simple behavior (Lewin, 1947). It could be considered as a possible predictor of IT rejection or acceptance.

In order to investigate further our research objective, we consider that Cenfetelli's (2004) dual-factor model of Information Technology use is an important model for us to start with. Similar to Lewins' (1947), this model considers that the IT use is affected by enabling and inhibitors factors as well. The model considers also that inhibitors discourage IT use when it is there, but does not essentially encourage the use when missing.

Based on the above description of Resistance and Cenfetelli's modelof IT usage, we suggest that pharmacies intentions to deploy ICT and more specifically PBM systems is based on the Technology acceptance model (Davis et al., 1989; Venkatesh et al., 2003), such as intention to use PBM, perceived ease of use and perceived

usefulness in addition to the resistance to change theory and the perceived risk. The below figure presents the proposed model:

Perceived usefulness refers to which extent the potential users suppose that the system

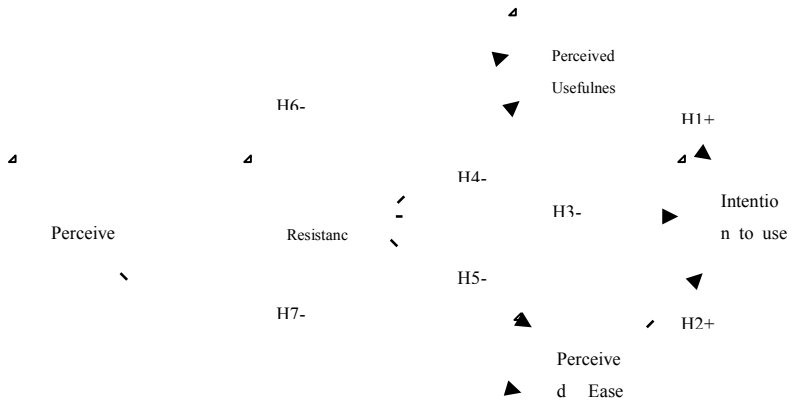

Fig. 2. Proposed model for online PBM adoption among pharmacists

use could improve the job performance, while perceived ease of use refers to which extent the potential users suppose that the system use could be somewhat free of any effort (Davis et al., 1989).

The TAM model proposed by Davis et al (1989), suggested that the perceived usefulness and the perceived ease of use as well are important cognitive factors that determine the IT use as people usually prefer to use a system that is efficient and beneficial to the related work without requiring any hard effort. Thus, and according to the TAM model, (PEOU) and (PU) are expected to influence their intentions to use IT. Therefore, we propose the following hypothesis:

H1- Pharmacists' perceived usefulness of PBM system use has a positive impact on their intention to use PBM system

H2 -Pharmacists' perceived ease of use of PBM system has a positive impact on their intention to use PBM system.

Yet, introducing a new system to adopt is usually subject to resistance as it would often cause significant change for the user's routine tasks. Therefore, users will most often tend to resist to change and the new technology implementation or adoption which would result in a lower intention to use (Poon et al. 2004) . Therefore, we suggest the following hypothesis:

H3 -Pharmacists' resistance to change has a negative impact on their intention to use PBM system

According to Cenfettelli (2004), resistance could also be considered as an indirect factor that could affect IT intention to use through mediators. (PEOU) and (PU) could be directly influenced by resistance. In light of this, we propose the following hypothesis to be tested:

H4 -Pharmacists' resistance to change has a negative impact on their perceived usefulness of PBM system use

H5 Pharmacists' resistance to change has a negative impact on their perceived ease of use of PBM use.

Jarvenpaa et al (2000) argue that perceived loss or risk could have an influence on the PU towards the intention to use. Vijayasarathy & Jones (2000) argue that the perceived risk has a negative influence on (PU) and (POEU) as well. Thus, we can consider that perceived risk is a measure that precedes (PU) and (PEOU). Therefore, we tend to propose the following hypothesis:

H6: Perceived risk has a negative impact on pharmacists' perceived usefulness (PU) of PBM system intention to use

H7: Perceived risk has a negative impact on pharmacists' perceived ease of use (PEOU) of PBM system intention to use

Following to the literature review, we propose a model to be used by the healthcare community and more specifically by pharmacist's to predict usage intentions by identifying the enablers and inhibitors from the perceived risk, resistance and change literature as well based on Cenfetelli's (2004) dual-factor model of IT usage. This model took into consideration the broad nature of association between the factors that enable or inhibit information technology use. The only restraint to their model is that they did not take any of the above mentioned constructs.—We have extended the model by recognizing factors that could affect PBM use. A preliminary model as represented in the below figure 2, summarizes our attempt to elaborate a model that could better understand pharmacist use of IT and more specifically the PBM system which will definitely require to be tested on a larger scale.

Therefore, a quantitative data will be collected from a large sample of pharmacist that own pharmacies and operate in Lebanon and then we will use the structural equation modeling to test the suggested model.

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Domestic hospitality: an IT based approach

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Keywords: Innovation, domestic hospitality, refugees, European migrant policies

Abstract. The year 2015 forced the world to contend with touching pictures of hundred of thousands of refugees fleeing from their home countries, risking their lives in the Mediterranean sea, trying to reach safer shores. UNHCR estimates that the number of global forcibly displaced people topped nearly 60 million. The main aim of this article is to consider how an IT based solution can contribute to the global refugee crisis. The research focuses on how citizens can contribute in innovative ways, rather than traditional governmental and institutional approaches. The innovative Italian initiative, called 'Refugees Welcome Italia' promotes domestic hospitality as a way to further integration. Among the other innovative aspects featured by this initiative, the most important is the participative nature. To reach this goal IT gives an important contribution, on the one hand helping people to communicate, on the other allowing social work practitioners to collect data and implement a tailored system.

1 Introduction

European national identities have become more diverse in the latter half of the 20th century. However, in recent years Europe has been confronted with several macroeconomic challenges along with a constant inflow of new migrants which has a direct impact on social cohesion. The Europe 2020 Strategy highlighted the need for our continent to take an innovative path to respond to these challenges by building upon one of Europe's key strengths; its talented and diverse creative population [1].
Thanks to IT, citizens may provide innovative input for social needs. As social innovation is currently encompassing more than just technological aspects, citizens and civil society organizations bring essential changes contributing to a more integrated and cohesive Europe. In this context, an adequate understanding of the nature of social innovation process is required to understand the prerequisite of social transformation. The paper proposes a theoretical framework for social innovation and an empirical case highlighting the influence of IT based services having a transformative impact on asylum seeking policies. The results of a six month participatory action research and subsequent co-design of the internal conformity of the organization and definition of the problems and priorities.

This paper proposes a theoretical framework for Innovation Management addressing practitioners who are not familiar with IT tools they need to exploit. The need for the development of this framework is justified through empirical work. This framework offers a solution, based on which designers can collaborate, identify opportunities for innovation, generate ideas, develop prototypes, identify weaknesses of their design at early stages, complete implementation and proceed with exploitation.

2 Related Empirical Work

The empirical work presented in this paper was conducted as a part of Oggioni's thesis project, which aims at highlighting the importance of co-design processes within the framework of civil society internal processes to create a bottom-up answers to fill the gap of governmental shortcomings. The empirical work consisted of a six months of participatory action research and co-design of the process. Using the tool 'The social innovation journey toolbox' authors helped RWI to consolidate the internal conformity of the organization and to define problems and priorities. Then the general assembly of the association co-designed and developed two outputs to facilitate the diffusion and the duration of the existing service through a higher involvement of users and stakeholders. The co-design process help us to highlight the importance as well as the shortcoming of an IT based social innovation such as the one studied in this paper.

More precisely the action research helped clarify to the involved practitioner the delicate equilibrium between online and offline phases, automatized and human-managed phases.

2.1 The social innovation journey toolbox

The tool is an output of the Transition project[3]. 'Inspired by the the Social Innovation Spiral by the Young Foundation and Nesta and shaped by Polimi Desis Lab, who used their design expertise to develop and visualize the model, the Social Innovation Journey is conceived as action format, focusing on the sequence of steps social innovators may go through acquiring the skills and capabilities they need to grow and increase the level of positive impact on the wider society'. It is a tool made by different cards aiming at helping social innovators to tackle internal problems. It starts with the analysis of the social problem and benefits of new service; then it summarizes the different stakeholders involved and impacted and the possible personas[4] [2]. Finally, through some others prompts, it ease the designing of the user journey, the interaction storyboard and the system map. It consists of two circles of support. The external one involves social innovators at an early-stage of maturity, helping them moving from an intuition to an idea to a

[3] http://transitionproject.eu/learning-outcomes/project-methodology/

[4] Personas are fictitious user representations created to embody characteristics, behaviors and motivations that real users might express or groups of users. The method is quite diffused but also contested in its epistemological validity.

structured proposal and a pre-prototype ready to be tested with a community of stakeholders. The internal circle works with more formalized and mature social innovations, supporting them to achieve a more structured and replicable solution. The tool is flexible it was thus modified according to the specific need of the social innovation under study [3].

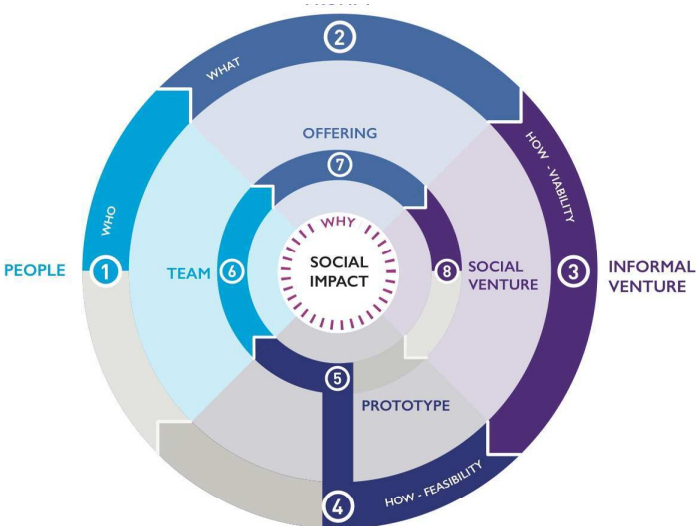

Fig. 1. The social innovation toolbox

2.2 The participatory action research

The participatory action research cannot be canonized in the form of a single, cohesive methodological approach, because it entails to consider what is usually objects of research, as research partners [4] [5]. The approach is particularly diffused in the study of marginalized people, or in the words of Rahman 'ordinary, underprivileged people ... collectively investigate their own reality, by themselves or in partnership with friendly outsiders, take action of their own to advance their lives, and reflect on their ongoing experience' [6]. As for this specific research, one of the author was a friendly outsider who helped the organization under study to consolidate the internal conformity, to detail the internal IT related work-flow and to define problems and priorities. It is important to stress that the two typical asymmetries of PAR did not fully apply. On the one side, the friendly outsider and the social innovators were on equal footing from the real beginning, since the latter had a large social and cultural capital. Some of them are also scholars themselves. On the other the typical divide between salaried researcher and free of charge co-researcher was blurred, being the first a young student, the latter professionals using their skills as social innovators.

3 Social Innovation

The term 'social innovation', in the last years, has entered the public domain as an ill-defined concept, which has tended to be overstretched [7]. For this reason we shall start by defining the historical context where social innovation was born. The concept is a product of the crisis of the traditional welfare system; it founds its application in series of interventions to promote better living conditions for people and communities [8]. The last economic crisis of the new century brought the Western world in a state of permanent austerity characterized by the appearance of new social needs. These needs are caused by important economic, cultural and demographic changes. In addition to this situation, the governments were not able to tackle growing needs because they have to control (or reduce) public deficit. In this context, characterized by new needs but old strategy to tackle them, there is a growing challenge to find new solutions. These are to be found within a change in the relationship between public and private sector, between who provides the service and the users. While the blurring boundaries between the private and the private sector has been studied at length within the framework of governance [9] [10], the shift between social policy beneficiary and, what we can call, social policy prosumers [11] [12] is quite new. As a matter of fact, in social services, as in the consumption of new media, the unidirectional relationship between providers and users is replaced by an active participation of citizens in the design of new products or public utility services. This is particularly true for web based services.
The normative emphasis that can be found in the literature on social innovation is quite diffuse [13] [14]. Nonetheless we must admit that some issues has never been solved by the welfare state, nor by the private sector left alone. For this reason unemployment, poverty and growing inequalities remain challenges for governments and communities across Europe, which may find a solution thanks to social innovation. In addition to these issues new social challenges emerged in the last decade: mass migration, asylum seekers and social inclusion of foreign peoples. Notably while member states are not able to tackle these dynamic coherently and in a sound manner [15] [16] [17], civil society and citizens are producing extremely interesting experiences. These new approaches can make a difference in addressing these challenges as a source of fresh, dynamic approaches mobilizing communities and building their own resilience. Social innovative solutions are thus coming from ordinary people in their own localities responding creatively and innovatively to the pressing challenges they and their communities are experiencing [14].

4 Italian policies for asylum seekers between security and social cohesion

While populations from the Middle East, South East Asia, and Africa have been crossing the Mediterranean to reach Europe in growing numbers since 2011, 2015

marked the sharpest increase arrivals to Europe and deaths in the Mediterranean [18]. In Italy, during 2015, an estimated 153,842 migrants [18] reached the Italian shore by boat, but only 40 per cent requested political asylum. Europe lacks secure channels for asylum seekers, leaving migrants only with perilous and dangerous route to reach the continent, at the same time public opinion is constantly shocked by the images of dead bodies reaching the shores. The major problem is that an effective answer would required a shared agreement at the European level. However, the EU, is facing multiple and sometimes insurmountable difficulties to act in a unified manner. The result is that the 'migration crisis' is becoming a dramatic humanitarian emergency and it is left mainly to the national level.
The conventional mode [19] for foreign citizens to enter Italy is the illegal way. They are welcomed in the centers for immigration where they receive assistance, they are identified and detained. In case of request for an international protection, some specific procedures start in order to verify the requirements; otherwise migrants are sent back to their own country. This increase the share of economic migrant asking for asylum, since nowadays is the only entrance allowed. The hosting system in Italy is divided into two phases: the phase of initial hosting in government centers and the second hosting inside the SPRAR, the official protection system for asylum-seekers and refugees.
The initial phase pf the Italian hosting system is complex, given the discrepancy between legal provision and everyday practices [20]. Notably migrants are obliged to stay in these structures, often built in remote areas, in which, from the structural point of view, the hosting function is marginal compared to the one of containment. The so-called second hosting takes place withing the SPRAR network, created by the Bossi-Fini law (189/2002). It is a decentralized system consisting of a network of private-public partnerships [21] made of local authorities and third sector organizations. It should provide an integrated hosting experience [19], i.e. the provision of services that aim to facilitate the acquisition of autonomy for the refugees/asylum-seekers (empowerment process). The services offered ranges from health care to multi-cultural activities, from legal information to job placement.
However the SPRAR system does not host all asylum seekers but only a minor fraction, barely reaching 25%. Therefore the Ministry of the Interior set up an emergency solution (CAS) since 2012, based on an allocation of asylums seekers to each Prefect according to the local population. Thereafter the Prefect, which does not have any internal capacity to directly manage the asylum seekers - being the territorial jurisdiction of the Ministry of the Interior - call for civil society and the private sector to manage the process. However, each Prefect is fully autonomous in drafting the public tender, creating the precondition of high variety of hosting conditions in Italy, often criticized [20] [17]. Indeed the range of services provided by CAS range from a minimum of lodging, food and health up to the fully fledged SPRAR requirements.
The time of staying depends on the specific situation but it rarely matches the legal provision. Moreover the system is fragmented, heterogeneous and based on security rather than social inclusion and social cohesion [22]. Indeed the

vast majority of CAS are made of big structures hosting dozens of asylum seekers without providing them with any tool for concrete autonomy nor any individualized project. As for the SPRAR partnership, the system features better lodging solutions (shared flats or small size centers) and a vast array of supporting tools.These however may vary a lot according to local capacity and local social capital. During this period the migrants are dived according to their status, via a formal assessment of the requisite for asylum. According to the Italian law and the Geneva Convention asylum seekers may be recognized as a Refugee, a Beneficiary of humanitarian protection or a Beneficiary of subsidiary protection. In all three cases migrant are protected and legally resident on the territory for given time spans.

5 Refugees Welcome: a political answer

The conventional way of hosting migrants in Italy is based on big structures. This way of doing things, in most cases increases inequality and social separation between residents and refugees. Indeed the system rarely acknowledge some of the most pressing needs refugees will have to face in their path towards autonomy: legislative discrimination, lack of familial relations, cultural discrimination (concertizing in lodging discrimination and labor discrimination). In most centers (either CAS or SPRAR) migrants rarely meets local people. The system does not allow people to know each others, to interact and to start a common path of social integration and social inclusion. The main idea of Refugees Welcome Italia Onlus (RWI) is to take care of the accommodation issue to promote an integration in the social context. As a matter of fact, considering refugees only, those granted a status of international protection shall enter the so-called 'third hospitality' because they are not yet able to organize by themselves an independent and dignified life. This directly lead to a problem which is both economic and social. On the one side the money invested in those people are at risk - since they can now move wherever they prefer, on the other they are are a vulnerable group at risk of poverty, marginality and exclusion. In most cases they did not have a chance to build significant social networks, nor to know the city where they are located and to engage their human and professional resources.
RWI is part of the international network Welcome Refugees, born in Berlin in November 2014. It promotes the diffusion of hospitality in families and in shared homes of asylum seekers and refugees through a web platform. It also facilitates disintermediation and spontaneous application of the ones who are willing to host. It started slowly its activity in order to check the feasibility in the Italian context, from a regulatory and administrative point of view [23]. Thereafter since December 2015 it started the activities in Italy according to an adapted version, which may considered itself an innovation of the original German social innovation. Indeed in order to scale-up in the near future the Italian organization designed the whole process from the beginning to the end so to tackle all critical aspects.
The social innovators behind the organization, while duplicating the German

prototype, exploit the flexibility of the web so to design a more coherent project given the Italian institutional constrains and the needs asylum seekers face in Italy (which are different from those faced elsewhere). In order to fully understand the importance of the IT based revolution, it is important to describe the vision and mission behind the organization. RWI promotes a cultural change regarding migration and demographic, social and cultural transformation taking place in Europe and in Italy [24] [23] [25]. It encourages the diffusion of experiences that help refugees to over-come the passive psychological dimension typical of the impersonal hosting centers. It wants to involve the resident population (Italian, foreign and foreign-born) inviting them to take an active role in hosting processes and social inclusion of asylum-seekers and refugees. RWI facilitates the launch and the sustainability of experiences of inclusion and social, economic and cultural development that have a positive impact on the territories. The association spreads over the entire national territory a new model of domestic hospitality for asylum seekers and refugees, to support and complement the existing models of first and second hospitality.
Given this mission and vision, it is now more clear the importance of information technology to design a coherent solution for RWI's needs. First of all, while existing experiences are based on word of mouth and territorial limitation, RWI aims at reaching the whole nation and everyone in the country. Secondly, the matching process, usually producing idiosyncratic results according to local actors preferences, requires to be standardized and uniform across the country so to provide migrants with a comparable experience from the shore of Lampedusa to the suburbs of Bozen. On top of that the IT procedures allow the system to be efficient, scalable and reproducible elsewhere. Furthermore, the Italian experience benefits from the German prototype and it is now feeding back the whole Refugees Welcome International Network.

6 The role of the IT based platform for Refugees Welcome

RWI may be considered innovative under different criteria. We can say that RWI is a new form of organization, done by the autonomous initiative of private citizens. This group started from the identification of a social problem, in this case, national policies for asylum seekers, and then they created a network around it. The initiative is context dependent and its success depends on the ability of the founders to aggregate different actors and give them an active role; everyone participates but with different skills and roles. Moreover even if the platform and the idea were taken from an existing German initiative, making it work in Italy posed many challenges. As we said in the previous section the initiative, even if scalable, is highly context dependent because of the high number of rules and regulations that control migrant's hospitality in Italy.
The research on and with RWI used the social journey toolbox as a tool to understand social innovation, but also to help RWI clarifying its internal flows and the role IT plays within. Indeed the main purpose of this toolkit was to help

researchers to understand better how the organization works and its main aspects. More specifically it helped the organization in five tasks: Definition of the social problem and what RWI offers; Relationships between RWI and the stakeholders; Personas and user journey; Interactive storyboards and system map, Service's challenges.
Two founders together with a researcher designed the possible internal work-flows and 'issue tracking system' (or ticketing) for both the family and the migrant (January 2016). The final results was presented to the other members of the association, during the following general meeting (April 2016). Therefore three goals were reached: definition of priorities, shared understanding, and better communication tool. As for the first two goals, RWI reached a higher level of cohesion and a share agreement on both internal procedure and external stance. The research thus helped RWI to have a common understanding of its own working style, routines and communications. This tool was also appreciated by the association for its clarity and summarizing power.
While communication, selection of priorities and the vision, were at the core of the research [3], the focus here is only on the role played by IT in the whole RWI matching process and in the management of the RWI community. RWI public interface is a Wordpress website (refugees-welcome.it) allowing both families and refugees to register via two simple contact forms. This allowed the media to present the project as a sort of Airbnb [26]. However there are many differences: the strong level of intermediation and the role volunteers play at the local level.

As regards to the commonalities between Airbnb and RWI, they relate to the IT based nature of the two services [23]. Given the mission of RWI, the implementation of a national database allows the service to reach everyone everywhere, to centrally monitor hospitality and to standardize the service provided. The website is a simple interface for the association which is active mainly on Facebook, Twitter and Instagram. The other channels of communication, along with media exposure [23] allow the website to increase the outreach. At the same time, the website is the gateway for both beneficiaries and volunteers with dedicated sections and online forms. Once the families (and the migrants) reach the homepage they are directed to the online contact form. The form requires families to provide a set of compulsory information. These information feeds an external social network database connected to a back-office CRM-like system. The database can be consulted by the Board of Directors in its complexity or by selected volunteers according to territorial boundaries, roles and privileges to ensure privacy and security for both migrant and families are in place. The selected volunteers are activated by a back-office system. After one year of ticketing directly managed by the secretary, the system is now moving to a formalized and automatized process based on WeTipp (the community management ITC tool). The work-flow is thus activated by a registration, feeding a database, which opens an issue (or a ticket) and assign it to the competent territorial chapter.[5] Therefore the system notifies the territorial chapter where the family resides

[5] The association is divided in territorial chapters, matching Provinces, thus the Prefect system.

and it opens the process to the following phases. Although the work-flow is partially off-line, volunteers constantly enrich the database and the 'issue tracking system' with feedback and further information. This allows the association to constantly monitor the matching progresses, territorial chapters and setting goals and benchmarks.

In order to better understand the process, it is important to highlight the two components on the online service: the host side and the guest side. The host side is perhaps the most simple, because flats can be registered on the web only (lower part of Figure 2). Net of different motivations families and individuals have to join, the flat feeds a database and opens an issue. The issue calls into action the territorial board and a given volunteer who subsequently profiled the host through a telephone interview and a follow-up meeting. The profile is later uploaded in the database so to provide the system with a better picture of what is happening offline at the territorial level. Once registered and interviewed, the family becomes matchable, i.e. the association looks for a suitable guest for it, among those in the database. The host side thus meets the guest side (upper part of Figure 2). It is important to highlight that the selection phase is fundamental to prepare the family to the following steps of the procedure, so as not to run into disappointment of expectations.
As for the migrant side, the flows is similar to the host side except for the online registration. Guest may register as an independent guest (thus directly feeding the database and opening the issue) or through a referral by a CAS or a SPRAR. The main difference lies in the workload that is placed on RWI. While for the refugees coming from a CAS/SPRAR, social workers are called to share their information with RWI, in the case of self-registered refugees RWI independently profile the candidate, once the ticket reaches the local level. As for the host side, the profiling of the guest is made by telephone as a primary phase and subsequently through in-person meeting. Once the refugee becomes eligible candidate, the association proposes a family. Meanwhile the back office system requires volunteers to continuously impute feedback enriching the database on the guest side too. The cohabitation is not the following immediate step. Once the guest/host couple has entered in the database a first meeting occurs in a neutral space, thereafter if both side agrees there are a series of self-organized meetings. The cohabitation starts as soon as they are ready for it. This flexible structure is conceived to reach two goals: on the one side built mutual trust from the beginning via leaving the final choice to the counterparts, on the other allows the process to be shortened in case of emergency.

The cohabitation is subject to different rules, according to the funding situation and the legal framework. It seems clear that the choice of RWI in these first months has been to focus on refugees only, without considering to start a CAS for asylum seekers. As for the funding, the cohabitation may be based on an economic exchange (for refugees with a job), a fully free-of-charge hosting, or a funded one. In the latter case RWI does not provide any economic support directly but behaves like a mediating tool and a support for micro-crowdfunding activities. Once the cohabitation starts RWI constantly follow the matching,

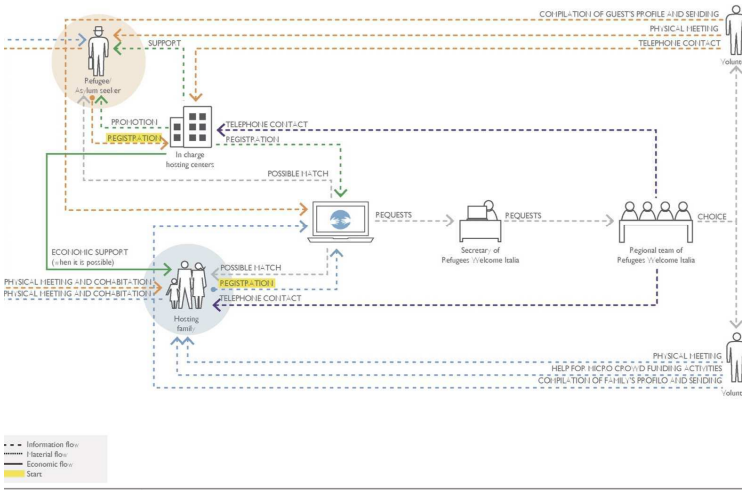

Fig. 2. System map

via mentoring and in-depth analysis. Notably the cohabitation is based on a signed contract in which both parts agreed on the term of service, duration and rules. The same contract is part of the retro-feedback volunteers provided in the back-office system, along with financial information and the monitoring notes. Indeed, RWI constantly monitors the cohabitation with the dedicated volunteers. The same volunteers activated by the ticket are lately monitoring the situation with a constant dialogue with both counterparts. The volunteers are required to produce a report and monitoring. Even if RWI is now working with an informal monitoring tool feeding a dedicated database, the association is now developing an online survey so to have a constant overview of all registered matches, creating a measurable metrics to better monitor single matches and the global impact. This monitoring system will be directly linked to the community management tool (WeTipp). On this platform hosts, guests and volunteers have their own personal profile. Profiles can be public or private, allowing full privacy to the refugees but also full disclosure for those volunteers willing to interact with peers. Each profile features socio-demographic data, competences and passions, providing RWI with a unique dataset containing all important information. On WeTipp both activists and simple members can have a direct contact with members of the community, while back-office tools are available only for those with specific privile. WeTipp however is not a simple directory of members, rather is the main governance tool. Among the dedicated features, the Board of Directors can set specific "calls to action" (goals on the platform) to focus content creation and browsing in across specific topics of interest for the community.

7 Between social innovation and social cohesion

The IT platform serves not only as a tool for registration and profiling, but as an important tool of awareness rising and territorial coverage. As a matter of fact, even though the Ministry of the Interior has discouraged domestic hospitality, since 2013 some SPRAR projects have emerged as pilot projects. The best known are in Asti by PIEM [6] and in Parma by Ciac[7]. However these projects are geographically limited and fully funded by the government. These two limitations are quite important, since they do not allow for domestic hospitality to spread in the society. On the contrary RWI represent a fully-fledged social innovation which is not only grass-roots in nature, but fully scalable because of the absence of geographical constraints and need of funding. Moreover the IT nature of RWI allows the system to be the only one with a database covering the entire country and providing donors and institution with detailed information about the project implementation. An other crucial limitation concerns the visibility of the non-IT project. Before the well advertised pilot test of Milan (January 2016) the national press was focused only on Refugees Welcome Italia. After some months the media coverage is still quite high [23]. This is particularly important for the social innovation to take place and to produce social transformation. Furthermore, after each media appearance RWI observed a clear impact on both the number of families and migrants enrolled in the project. This has been particularly true for television coverage (+30%), but also for newspaper articles (+7%).
RWI moreover has its impact on society since it allows for transformation of the resident population's perceptions. Directly increasing the interaction between society and refugees within the familial environment, indirectly via national awareness raising as well as community outreach of the family. Better still, each host family becomes an ambassador for the project, as well as of the transformative power of RWI. The growth of RWI allows these and other related cohesive experiences to emerge and flourish.

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What Are You Talking About? Investigating Online Information Disclosure in Italian IRCCSs

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Abstract. This paper proposes an exploratory study on voluntary information disclosure of the Italian IRCCSs joined to Facebook for sharing information outside organizational boundaries. Respect than prior research investigating the factors leading health care organizations, and the IRCCSs in particular, to use Facebook, this study moves toward understanding what information is disseminated through such social media. Using the content analysis methodology, we analyzed the Facebook official page of all Italian private and public IRCCSs. Results have shown that the Italian IRCCSs mainly use social media for sharing information about the following topic categories: brand and reputation, fundraising, and health care services.

Keywords: social media; Facebook; e-disclosure; health care organizations; IRCCS.

1 Introduction

The aim of this study is to propose an exploratory research about voluntary information disclosure of Italian IRCCSs joining to Facebook in order to communicate and share data and information with the public by providing health services. Investigating the information content of official Facebook fan page of the Italian IRRCSs serves to put in evidence what kind of information disclosed these health care organizations tend to offer.Today, the Internet technologies and social media as source of health care information are increasingly driving e-health care service promotion and diffusion in order to better enhance the communication with citizens and improve quality and accessibility of healthcare services. New technologies and social media offer opportunities for health communication driving public organizations to interact with citizens using their official websites as form of e-disclosure in order to appear as accountable and responsive institutions. Social media drive health care organizations to search for a dialogue and connect with citizens making available a high amount of information about their services for reinforcing their image and reputation. In the last decades, social media, especially social networks like Facebook, are gaining rapidly popularity [1]. In this study the focus is on Facebook, the popular social communication tool founded in 2004 and originally designed as a social networking site for students at Harvard University, and then

available to anyone to allow users to contact and communicate with others without any temporal and geographic and barriers. Social media, especially Facebook, is deeply changing the nature of privacy and the consequences of information disclosure. Although there are some negative consequences of disclosing information on Facebook, most organizations in any contexts tend to adopt this channel in their communication process without considering the potential costs of this disclosure [2]. The Internet and social media websites tend to increasingly emerge as health information sources for the public so as to contribute for quality of health care. Social media contribute to make the information sharing more democratic and patient controlled enabling the health-related information exchange. There are few studies investigating the role of e-disclosure and use of social media in health care organizations and services so as to justify an exploratory analysis about the informational contents offered by a specific kind of health care organizations like In Italy, the Scientific Institutes for Research, Hospitalization and Health Care (IRCCSs) are considered as hospitals of excellence that tend to serve mainly clinical and translational research purposes in the biomedical field and in health care services by providing high specialty in terms of hospitalization and patients' treatment. The IRCCSs embracing social media and networks for better providing an effective communication with their public tend to privilege informational contents related to fundraising, health care service, brand and reputation by enhancing their positive image in front of the stakeholders and public strengthening a service function for preserving customer loyalty. The paper is organized as follows: in the second paragraph, role, we explore functions and task of the scientific institutes for research, hospitalization and health care. In the third paragraph, we analyze the voluntary disclosure by using social media in health care services. Then, research methods and data analysis are presented. Finally, discussion and conclusions follow in the last paragraph.

2 The Scientific Institutes for Research, Hospitalization and Health Care

The Scientific Institutes for Research, Hospitalization and Health Care (Istituto di Ricovero e Cura a Carattere Scientifico) (IRCCSs) are Italian hospitals of excellence that serve research purposes, mainly clinical and translational research[1] in the biomedical field and offer high specialty about hospitalization and health care services[2]. The IRCCSs have public or private legal status: currently, the institutes that have obtained this scientific recognition are in total 49, of which 28 of them are public and 21 private [3]. Public IRCCSs are public national relevant institutions subjected to regional control and supervision of the Ministry of Health. The Minister appoints the scientific director of public IRCCSs, within a shortlist of candidates

[1] Translational Medicine promotes basic laboratory research results immediately applying to the patient's bed, based upon multidisciplinary sharing of clinical knowledge convertible into technologies.

[2] http://www.salute.gov.it/

selected by a special commission. About the legal status of IRCCSs in the Legislative Decree 288/2003 it is stated that the Region in which the Institute has its prevailing clinical and research activities and headquarters can transform public institutes into important national foundations, open to the participation of public and private entities and subjected to the supervision of the Ministry of health and the Ministry of economy and Finance. Processed entities shall be referred to IRCCSs Foundation. In the case of impossibility or failure to transform them into foundations, their participation in national networks of centers of excellence, to guarantee anyway the satisfaction of public research needs. The Ministry of Health intends to continue monitoring of the IRCCSs to ensure that the research they carry out is aimed to the welfare functions of the National Health System (SSN) and to the assistance of the patients: IRCCSs represent a fundamental technical and operational support to other bodies of SSN in the area of health research and staff training, and contribute to pursuit the National Health Plan (PSN) objectives. Instead, private IRCCSs have a greater freedom of action and the control over their performance and research value appraisal.

The "recognition of the scientific character" is the process through which these emerging realities hospitals, which treat particular diseases of national importance, were classified as IRCCSs: this gives them the right to the use of state funding (to be added to the regional funds) finalized solely to the pursuit of research activities related to recognized subjects [3]. The recognition of the scientific nature of public and private institutes is subject to the possession of the following requirements as prescribed by Legislative Decree 288/2003 and subsequent amendments and additions:

- the legal personality under public or private law;
- the property right and the health care accreditation;
- the cost-effectiveness and efficiency of the organization; the quality of facilities and technological devices;
- the excellent level of hospitalization and treatment of high specialty directly performed in the last three years, with technical and scientific contribution nationally and internationally recognized in the context of biomedical research activities, in order to ensure a higher quality of care, attested by the public structures of the National Health Service;
- the character of excellence during the last three years into specific discipline research assigned;
- the demonstrated ability to connect to the networks of research institutes in the same area of reference and to collaborate with other public and private entities;
- the demonstrated ability to attract public funding and private independent funds;
- the services quality certification, according to internationally recognized procedures;
- the competent regional governance delivers its opinion on the consistency of recognition with its own health programming.

- Subsequently, the Ministry of Health will appoint an evaluation committee for each institute, formed by at least two experts in the discipline object of the request for recognition.
- Within thirty days of such appointment, the commission shall give its reasoned opinion on the existence of the regulatory requirements, the completeness of the documentation attached to the application (the committee may carry out the necessary inspections, site-visit, to assess the acquired data).
- Within ten days of receiving the opinion, the Ministry of Health takes care of the dossier was transferred to the Permanent Conference for relations between State, regions and autonomous provinces of Trento and Bolzano, for the delivering of the opinion of competence.
- At the end of the procedure, the recognition is arranged by ministerial decree, after reaching agreement with the President of the Region concerned.
- Every two years, the IRCCS Foundations, public Institutes and private law IRCCS must send the update of their data to the Ministry of Health, demonstrating the residence of the legal requirements (Ministerial Decree 5/2015).
- According to the Assessment Commissions and the Ministry of Health each two years the list of public and private law IRCCS that have received recognition or confirmation of the scientific nature is published, as well as the list of IRCCS for which is under way for the confirmation process.
- The IRCCS activity must be related to well-defined areas of clinical and translational research, that should necessarily have therapeutic applications in hospitals: they may receive recognition for an individual area (single issue IRCCS), or for different integrated biomedical matters (multiple issues IRCCS). Currently IRCCS on the national territory belong to the following areas of expertise: cardiology; dermatology; diagnostic imaging; pharmacology; gastroenterology; genetics; geriatric medicine; infectious diseases; complexity medicine; neurology; neurorehabilitation; ophthalmology; oncology; orthopedics; pediatrics; psychiatry; rehabilitation.

3 Online information disclosure in health care services

In the last decades, because of the crucial role of information in any sectors, especially in the services industry, and considering the numerous scandals about financial disasters and episodes of misinformation, scholars and practitioners are paying an increasing attention to the voluntary disclosure. This phenomenon, differently from mandatory disclosure, consists in spontaneously communicating and sharing information and data outside the organization using different sources, e.g. annual reports, financial statements, official websites or social media [5,6,7]. More specifically, voluntary disclosure concerns the tendency of organizations in any sectors to spontaneously and independently share and spread all information and data outside their boundaries. Most scholars have outlined the positive effects of voluntary disclosure of information by firms, especially in accounting or banking industry, in terms of reducing information asymmetry [8,9], or the cost of capital [10,11], or also

because it allows the market to develop more earnings [12,13,14]. In the literature on the voluntary disclosure numerous studies demonstrate that shareholders and, in general, all the individuals outside the organizations, prefer more voluntary disclosure to less [15, 16, 17, 18, 19]. The first studies on voluntary disclosure dating back to Sixties mainly documented the impact of organizational characteristics, such as size, listing, leverage and managerial ownership, on disclosure [20]. More recently, researchers outline the negative earnings derived from disclosure [21] or the effects on the cost of equity and debt capital [6, 22].

Focusing our attention on health care system, it has been evidenced that professional societies merely identified voluntary disclosure as an ethical obligation for health care organizations, where, in 2001 the first disclosure standard, fixed by the Joint Commission on Accreditation of Healthcare Organizations, required that patients need to be informed, about all outcomes of care, including "unanticipated outcomes." [23, 24]. Voluntary disclosure would represent a significant incentive to health care providers and institutions for improving their care in most countries all over the world [25]. Thus, voluntary disclosure becomes a relevant phenomenon to investigate in health care context, because of the nature and very complex implications of this organizational context for the community, however, studies on this topic are still scarce and limited.

Voluntary disclosure is significantly affected from the widespread of new technologies, mainly the innovative communication channels through internet, especially, social media applications, such as Facebook, Twitter, YouTube which are deeply changing the way to communicate, and, hence, the way through which organizations interact with stakeholders such as customers, business partners, and suppliers [26]. Indeed, health care providers across the globe look more and more to information technology (IT) as a means of making health care systems safer, more affordable, and more accessible [27], using the new communication channels, like social media, for sharing information and data outside their boundaries. For this reason, in the last years, numerous health care organizations have added to their official website (e-disclosure) also several social media to communicate whit customers, for guaranteeing the transparency process regarding their services, developing more relationships of trust, and improving their image and good name.

Some scholars broadly analyze the potential health and financial benefits of health information technology (HIT) [28]. In particular, the widespread adoption of electronic medical record (EMR) systems affects positively the budget for health care organizations in U.S. estimating relevant savings and costs [28].

Using new technologies, especially social media, in their communication process, health care organizations at any level and specialization, can effectively response to the information asymmetries usually existing between health care professionals (physicians, health managers, nurses, and so forth) and customers (patients, families, and so forth); hence, social media are increasingly using to disseminate information among health professionals and patients and also, more recently, to share data for surveillance and research [29].

Analyzing voluntary e-disclosure in health care context through social media, we observe that the main question investigated regards how to engage patients with social

media understanding their main habits and patterns with these new communication channels [30], respecting ethical issues, with concern about privacy and anonymity [29], and also evidencing the main patients' and health professionals' motives, barriers and expectations in using social media for health-related reasons [31, 32, 33, 34]. Furthermore, some scholars aimed to identify and investigate the uses, benefits, and limitations of social media for health communication among the general public, patients, and health professionals, evidencing mostly that despite the benefits in using social media for health communication, the information exchanged needs to be monitored for quality and reliability, as well as and the users' confidentiality and privacy need to be guaranteed [35, 36, 37, 38, 39, 40].

Although some concerns are expressed about the lack of attribution and quality of information on social media sites [41, 42, 43, 44, 45], health professionals, patients and caregiver populations are broadly using social media [46, 47, 48], especially for disseminating health promotion messages [49], medical education [50, 51,52], and information at conferences [53, 54].

In some medical areas the usage of social media is very relevant, for instance, oncology professionals widely adopt social media for their networking, interfacing with colleagues and patients, and clinical trials activities, but, of course, there could be pitfalls and risks [55]. Also, in the clinical care social media are being used with potential implications in terms of ethics, professionalism, and society; in fact, physician practices are also using Facebook pages, Twitter accounts, and blogs for growing their practice and earning patient referrals [56].

Furthermore, researchers more often studied social media in educational than practice settings in health care showing that most toils aimed to facilitate communication or improve knowledge among health care professionals in their training process [57].

Most contributions of the literature on voluntary e-disclosure using social media in health care system adopt the perspective of users, that is both health professionals and patients, the point of view of the overall health care organizations is still under represented and unexplored.

Some authors analyzed the use of social media networking in the health care industry providing suggestions for successful implementation of social media applications in health care marketing strategy [58]. For instance, Usher [59] (2011) investigated the types of social media (Web 2.0) usage associated with eight of major Australian allied health professions (AHPs) evidencing that participants mainly preferred educational courses that were offered online. Others performed a content analysis of web-pages for analyzing transaction files from five health-related we-pages [60] or for studying health-related information provided in the Web to get an overview on the medical content available, comparing the content of medical Question & Answer Portals, medical weblogs, medical reviews and Wikis [38]. In this last study, health-related Web resources outlined substantial differences in their content, in fact, "Weblogs and answer portals mainly deal with diseases and medications, instead Wiki and encyclopedia provide more information on anatomy and procedures" [61]. Differently from existing approaches, Denecke and Nejdl [38] focused on weblogs in the domain of medicine, still under researched, describing how

the results, through entity extraction and sentiment analysis, can be exploited for efficient and effective classification purposes. Their approach distinguishes "affective and informative medical posts based on the extraction of informative and affective content" [61].

Further scholars analyzed user messages in social media for measuring public health related to population, for example, correlating Twitter messages with some diseases [62]. In particular, it was considered a broader range of public health applications for Twitter, applying the Ailment Topic Aspect Model, to automatically extract data about illness over times from Twitter [62].

In addition, one relevant longitudinal study conducted by Van de Belt and colleagues [63] explored the use of social media by hospitals in 12 Western European countries through an Internet search to identify to what extent Western European, general and university, hospitals use social media. Patients increasingly use social media for communicating especially to find support for their diseases. Health care institutions, including hospitals, would actively use social media speeding up communication and information provision to patients and their families, thus increasing quality even more [63]. Social media use and awareness in Western European hospitals are significantly growing, evidencing some differences between countries; indeed, the group of hospitals using social media is still small, except for the Netherlands and the United Kingdom, with greater focus on LinkedIn and Facebook [63].

More broadly, Grajales III and colleagues [64] provided an interesting narrative review presenting case studies to illustrate "how, where, and why social media" are being used in the medical and health care sectors. They reviewed, evaluated, and synthesized 76 articles, 44 websites, and 11 policies/reports reporting 10 different categories of social media (blogs, microblogs, social networking sites, professional networking sites, thematic networking sites, wikis, mashups, collaborative filtering sites, media sharing sites, and others e.g., SecondLife). They evidenced that the stakeholders (i.e. clinicians, administrators, professional colleges, academic institutions, or ministries of health) engaged with social media for attenuating risk would "maintain professionalism at all times; be authentic, have fun, and do not be afraid; ask for help; and focus, grab attention, and engage" [64].

Another interesting research empirically investigated how much health care organizations really and actively manage their social media presence, showing that active social media management can drive more user-generated content but this mainly depend on the growth of user postings from employees rather than from its clients [65]. Because of the widespread of social media in the medical and health care sectors, still many questions in terms of governance, ethics, professionalism, privacy, confidentiality, clients' o customers' participation, and information quality need to be still addressed requiring further and deep research on the phenomenon, especially in the perspective of the overall health care organizations. Health care institutions need to engage with social media in a safe and ethical manner always respecting the particular nature of the services provided. In this direction, it would be very relevant and interesting to investigate more deeply the content and the specific orientation of

information disclosed by health care organizations using social media, like Facebook, the most common social networking.

Therefore, the big dilemma in health care system, in general, and, for IRCCSs, in particular, is: "to tell or not to tell?", because of the presence of many interests and stakeholders, and in reason of the private nature of the subjects, when we talk about diseases, patients, healthcare professional activities and responsibilities.

In the following section we try to photograph how IRCCSs give answers to this dilemma, which kind of theory before exposed they remark, and we also intend to fill literature gap, considering not only oncology institutes, but all the types of clinical research, generally less visible in academic literature in spite of the relevance of their scientific results, just because of the smaller number of patients and professionals concerned with their clinical issues. For instance, Healthcare Italian Ministry periodically public a report about how to improve excellence accreditation parameters of Oncology IRCCSs, trying to mix different European and American criteria, generally defined for health care system, or specifically referred to research institutes, focusing only on oncology field, without considering interesting and emerging clinical fields and research networks specialized in new clinical matters or in an innovative way in old less numerous diseases, maybe younger and more dynamics from the online communicational perspective, as a kind of "digital natives" research creatures.

4 Research method and data analysis

We analyzed the Facebook official page of all Italian public and private IRCCSs with aim to explore how the latter use social media in the external communication strategies. The Italian IRCCSs are 48, of which 20 are public and 28 are private [3]. Of the 48 Italian IRCCSs, only 26, of which 9 are public and 17 are private, joined to Facebook. Data was collected from official Facebook fan page of the Italian IRCCSs during the period from the 25th of March to the 25th of May 2016, while data coding took place towards the end of May 2016. Although the Italian IRCSSs are 26, we collected all posts from 16 of them because the others had set restrictions. After data collection, data was performed by using a qualitative data analysis software, such as NVivo, that has been recognized as particularly suitable software to aid qualitative data management and analysis for social research [66].

Before performing data analysis activity, the posts uploaded on Facebook fan pages were manually codified for assigning topic tags. In particular, we manually evaluated and codified the first 50 posts uploaded for each of 16 IRCCSs. Then, we automatically codified data in restrictive way by using the topic tags previously created. All posts codified both manually that automatically were subsequently checked for relevancy.

Table 1 contains the aggregated final results for our sample.

Table 1. Descriptive analysis of the Italian IRCCSs' posts

IRCCS	Posts and comments uploaded	Topic tags	Codified posts	% of codified posts
Istituto Oncologico Veneto	1,637	27	647	39.52
CRO - Centro di Riferimento Oncologico	1,977	26	730	36.92
Fondazione IRCCS Istituto Nazionale per lo studio e la cura dei tumori	3,841	27	1,378	35.88
Istituto Ortopedico Rizzoli	545	22	170	31.19
Istituto Giannina Gaslini	7,165	28	1,447	20.20
Istituti fisioterapici ospitalieri - Istituto Regina Elena Istituti fisioterapici ospitalieri - Istituto Dermatologico Santa Maria e San Gallicano	703	27	170	24.18
Istituto per le Malattie Infettive Lazzaro Spallanzani	473	22	82	17.34
Istituto Ortopedico Galeazzi	1,787	26	534	29.88
IRCCS Multimedica	220	19	96	43.64
Istituto di ricerche farmacologiche Mario Negri	2,394	26	749	31.29
Istituto Clinico Humanitas	9,406	25	2,794	29.70
Policlinico San Donato	3,372	23	985	29.21
Istituto Eugenio Medea	381	25	139	36.48
Istituto scientifico romagnolo per lo studio e la cura dei tumori	522	23	196	37.55
Fondazione Santa Lucia	897	24	174	19.40
Ospedale pediatrico Bambino Gesù	5,259	25	1,165	22.15

Table 1 shows the amount of the posts and comments uploaded on the Facebook Official fan page by IRCCSs and followers, the topics covered in the posts, the codified posts in manually and automatically ways, and the codified posts in percent for each IRCCS. Building up the literature [26, 29, 30, 31, 32, 33, 34, 35, 37, 41, 46, 47, 48, 49, 51, 52, 53, 54, 55, 56, 57, 58, 59, 61, 62, 63, 64, 65], we also classified the codified posts into 6 categories, such as a) brand and reputation; b) fundraising; c)

health care services; d) clinical research; e) promoting events and press releases; f) organization and work issues. Brand and reputation consists of the set of marketing strategies and communication methods aimed to improve the image of IRCCS and to distinguish it from other ones. Fundraising consists of the set of initiatives directly or indirectly organized with the aim to raise funds for research. Health care services consists of the set of prevention, diagnosis and treatment activities that IRCCS provides to weak and sick people. Clinical research refers to the study of health and illness in people in order to develop new diagnostics and treatment protocols. Promoting events and press releases concerns those initiatives organized and/or sponsored by IRCCS for educating people on medical issues. Finally, organization and work issues refers to any change in the organizational structure and working practices. Table 2 contains a list of categories for Italian IRCCSs.

Table 2. List of categories for Italian IRCCSs.

IRCCS	Brand and reputation	Fundraising	Health care services	Clinical research	Promoting events and press releases	Organization and work issues
Istituto Oncologico Veneto	340	177	78	3	39	10
CRO - Centro di Riferimento Oncologico	388	126	99	11	85	21
Fondazione IRCCS Istituto Nazionale per lo studio e la cura dei tumori	819	231	178	42	85	23
Istituto Ortopedico Rizzoli	57	67	13	6	19	8
Istituto Giannina Gaslini	1,038	160	160	16	36	17
Istituti fisioterapici ospitalieri - Istituto Regina Elena Istituti fisioterapici ospitalieri - Istituto Dermatologico Santa Maria e San Gallicano	73	22	47	10	16	2
Istituto per le Malattie Infettive Lazzaro Spallanzani	26	7	22	10	17	0
Istituto Ortopedico Galeazzi	287	44	165	13	12	13
IRCCS Multimedica	26	18	48	0	3	1
Istituto di ricerche farmacologiche Mario Negri	138	339	92	37	95	48
Istituto Clinico Humanitas	2,252	322	195	2	8	15
Policlinico San Donato	539	66	296	12	64	8
Istituto Eugenio Medea	43	31	14	3	41	7
Istituto scientifico romagnolo per lo studio e la cura dei tumori	65	75	ù24	11	19	2
Fondazione Santa Lucia	61	26	27	5	45	10
Ospedale pediatrico Bambino Gesù	487	132	449	31	37	29
Total for category	*6,639*	*1,853*	*1,917*	*212*	*621*	*214*

Table 2 shows that posts uploaded on the Facebook official page of the Italian IRCCSs concern information about: brand and reputation (6,639; 57.95%); fundraising (1,853; 16.17%); health care services (1,917; 16.73%); clinical research (212; 1.85%); promoting events and press releases (621; 5.43%); organization and work issues (214; 1.87%).

Finally, we also stressed data for performing the most cited words. Figure 1 shows the word cloud in Italian language.

Fig. 1. Word cloud of the most cited words

Excluding the names of the Italian IRCCSs and function words (such as determiners, conjunctions, prepositions, etc.), Figure 1 highlights that the most cited words are the following: grazie (thanks); tutti (all); pazienti (patients); anni (years); medico (physician); vita (life); bambini (children); heart (cuore); buono (good); auguri (wishes); molto (a lot); cura (care); tumori (cancer); health (salute); lavoro (work); persone (people); malattie (illness); progetto (project); nazionale (national); ospedale (hospital); fondazione (foundation); responsabile (director); prevenzione (prevention); reparto (department).

5 Discussion and conclusions

The content analysis highlights some interesting counterintuitive findings related to communication strategies used by IRCCSs through social media. According to an overall perspective, the guiding principles that lead health care Italian institutions to get the title of IRCCSs, thanks to recognition of their scientific nature by the Ministry of Health, would bring us to think that these institutions would lay special care in publicly communicate and announce the results of their research and their contributions to the advancement of scientific knowledge in a clinical setting, through also promoting events and press releases. Instead, current content analysis shows that categories of "clinical research" and "promoting events and press releases" reveal a very lower total number of communication through Facebook about these matters, respectively compared to increasing categories concerning "fundraising", "health care services", "brand and reputation" (table 2 "total for category" line).

IRCCSs pay more attention on communication to patients, their families, and care givers information about ordinary and new health care services, calendar of medial visits, prescriptions, blood collection (health care service communication category), in line with the main activity of caring for weakest and sick people; furthermore, IRCCSs pay greater attention to enhance customer loyalty and their positive social image, dispensing greetings, thanks, awards and honours, discounts on medical visits, (brand and reputation category). The prevalence of these three categories of communications can mean that on a social media communication perspective prevail the goals of service production, financial and marketing functions, corresponding to "clinical research", "organization and work issues" (new job practices and "work with us" procedures), "promoting events and press releases" communication categories. Intuitively, however, we could instead wait for much emphasis was given by IRRCSs to the social communications to publicize the results of clinical research and the organization of events to promote clinical research.

The lack of publicity of promoting research events may correspond to poor organization of such events, and could be explained not through a lack of interest in clinical research but through the voluntary concealment of scientific research advances, in reason of the main role played by pharmaceutical companies in financing the most exciting medical findings, that enhance and affect confidentiality processes to overcome their competitors, getting business advantages.

It is rather a result that could be expected, the territorial location emerged by findings, which results in line with the different levels of health development that see prevail the quality of clinical services in northern and central Italy: the more active institution in a communication perspective through social media are located in Milan and Rome (Istituto Clinico Humanitas in Milan, Fondazione IRCCSs Istitutio nazionale per lostudio e la cura dei tumori in Milan, Ospediale Pediatrico Bambino Gesù in Rome, Istituto di ricerche farmacologiche Mario Negri in Milan).

Finally, in line with prevailing literature on the importance of the communication in health care services in presence of diseases that have strong emotional impact for high gravity, low life expectancy or young age of the patients, quantitative prevailing

communications flows are linked to institutions that treat cancer diseases of adults and child care.

The study presents several limitations, related mainly to its exploratory nature and the small size of the sample investigated. Thereby, the study can be considered as an interesting research starting point in order to find new and more intriguing aspects to analyze, which can explain more deeply the different role and usage of social media, especially Facebook, by health care institutions trying to evidence their risks and benefits.

Indeed, previews research mostly investigated the usage of social media mainly in the perspective of health professionals and patients without paying a relevant attention to the overall health care organizations. Our study can partially fills this gap in order to develop, in the future, a research design in which crucial variables could be identified to create and implement social media structures more responding to the health professionals' and patients' needs in a safe and ethical manner. Hence, future research could better understand the synergies between social media and evidence-based practice, in the direction to develop institutional policies that benefit patients, clinicians, public health practitioners, and industry alike.

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Towards a Smart Town Centre: an Integrated Approach of Real and Digital Worlds

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Abstract. This paper is an attempt to develop a new way to overcome the impoverishment of town centre retailers. From the combination of physical and digital elements, town centre retailers can develop multidimensional experiences for people that living the town centre. By welcoming the challenge to create multidimensional experiences, traditional shops will be able to integrate digital commerce and digital solutions to create interactive experiences where passers-by can interact with content using simple hand gestures and natural movements, browse product catalogues, navigate shops' websites, and download files and transfer them directly to their smartphones. From literature analysis, a consensus has emerged that the Internet use and digital strategies are not being exploited fully as tools able to revitalize town centres and create vibrant streets offering a multidimensional experience. Thus, this work will provide a model of a smart town centre by combining physical and digital elements in revitalizing a town centre.

Keywords: Smart town centre •Digital solutions •Digital commerce

1 Introduction

The town centre plays a primary role in social and economic aspects of an urban area by having a wide and varied impact on the environment [1]. In particular the town centre is the core of attraction for people, the central part of town that in general is connected with shopping and retailing [8] and for this reason town centre retailers play a central role in the development of town centre. The development of town centre's economy is strictly connected with the vitality of retailers because now as in the past people come to the town centre to buy and sell, to meet people and stay together. In the last few decades, the attention of scholars and practitioners on the development and revitalization [2] cities and particularly on the town centre has grown strongly by considering three principal aspects: the growth of population in urban areas, the intensified use of the Internet in recent decades [3,4], and the increasing advancement of the ability of people to purchase products and services online [5].

The report of United Nations Population Fund attests that more than half of the human population, 3.3 billion people, lives in urban areas [6]. By 2030, it is expected that almost 5 billion worldwide will live within cities and, as shown in Figure 1, more than 85% of the EU population will live in urban areas by 2050 [7].

For these reasons, the future of cities and its survival depend on decisions made in preparation for this growth [6]. Cities must find strategies able to manage new challenges related to the development of technologies and build up smart cities that should be considered a new way to think of the city of the future [8]. One of the most profound changes happened in the last decades in the world of business was the introduction of the Internet and digital technologies related to the commerce [9]. The impact of digital commerce, in business collaboration, in customer services, and in shopping as well as in the delivery of various services is so strong that almost every organization is affected. Therefore, nowadays cities must consider the importance of technologies that are able to help their revitalization and to transform traditional city in a smart and vibrant place.

The term "smart city" was first used in the 1990s and several definitions have emerged over time [1], often by applying alternative adjectives like intelligent or digital [10,1]. In general, this concept has attracted a lot of interest from academia and practitioners, and many cities have created smart city initiatives. The development of smart cities is becoming an imperative for the management of cities in order to create a place with a good quality of life. Particularly being smart is connected with the sustainable economic development, with the constant improving quality of life and with the right managing resources, and with the adoption of technologies to help people to simplify their life. Taking into consideration the different aspects enclosed in the term "smart", after reviewing different meanings of the smart city [11], this paper uses the term smart and consequently "smart town centre" only from the technological perspective [12] applied to the town centre retail. In that sense, this paper considers a "smart town centre" to be a physical space within cities, in which buildings, roads, bridges, and other infrastructure is linked to a new set of technologies, devices, and applications [11]. This paper considers a Smart Town Centre as place where people (citizens - tourists - investors) have the possibility to actively integrate in the town centre life. More precisely technologies help people to live immersive experience with town centre with all of five senses.

Furthermore a smart town centre can be considered as a part of the city with a great presence of technologies that transforms the traditional town centre into a vibrant and vital town centre with the support of mobile devices enabling ubiquitous access to data and the web, quick response (QR) codes over buildings, wireless networks, network interoperability giving 100% Internet usage, applications for smart phones, GPS devices, and augmented reality visualisation.

More specifically, the expression "smart town centre" refers to an "instrumented" place with the capability of capturing and integrating live real world through the use of sensors, appliances, personal devices, and any other digital devices [10]; an "interconnected" place with the capability to connect people, infrastructure, and town centre elements using new technologies [13]; and an "intelligent" place capable of using different ways to connect and communicate with citizens [14].

The smart town centre must transform the place where people live, work, and visit in order to attract citizens and investors through the implementation of technology, subsequently transforming this urban area in order to transform life and work [11,1].

The purpose of this paper is to understand how a town centre reshapes as a "smart town centre" by combining physical elements, such as refurbishment of the streets or the recovery of the historic downtown shops, with digital devices. In detail, the first part of this work explores the literature regarding concepts of a new kind of digital commerce, such as electronic commerce, mobile, and social commerce, highlighting the different meanings given to these forms of digital commerce. The choice to take into consideration these kinds of digital commerce is related to its large development in last years, in particularly with the adoption of digital commerce by town centre retailers. By using electronic commerce a traditional shop has the possibility to create a new window to sell its products also when the shop is closed. On the other hand the mobile commerce helps people to view products directly from their mobile. Finally through the social commerce retailers and consumers have the possibility to stay in touch everywhere and every time, and consumers have the possibility to share their shopping experience with the community. Next, it analyses the most important digital solutions that can be integrated with this digital commerce to create a new way to manage the town centre retail environment to revitalize retail in urban areas. The analysis of particular kinds of digital solutions is strictly connected with the research of potential instruments that can help the re-birth of the traditional town centre with the development of a new way to do shopping. Nowadays people need to new stimuli and consequently only particular kind of technologies involve people in new immersive experience. Finally, a theoretical model it is proposed basing on nine hypotheses, by combining physical and digital elements in revitalizing the traditional town centre to create a "smart town centre", with a discussion of the main findings of the study.

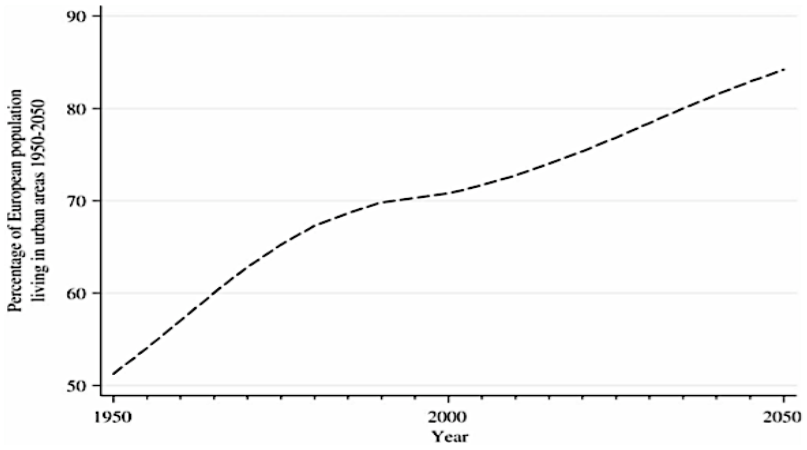

Fig. 1. Growth of EU population from 1950 to 2050 (on percentage). (Source: UN, 2009)

2 Theoretical Background

2.1. Commerce via Internet: E-commerce

The development of digital commerce through the Internet is defined as electronic commerce or e-commerce. More specifically, this kind of commerce can be summarized as the exchange of information, goods, services, and payments through the Internet [15,16,17], which offers a wide array of options in relation to content, products, and services [18,19], and which affects the perception and attitudes of traditional market retail [20]. E-commerce can also be considered an innovation process and one of the main Internet applications that offers attractive opportunities for retail growth [21,19,22,23]. E-commerce tools could be used individually by shops within the town centre [24] as well as by the town centre retailers for wider use, for example, for purposes of solidarity, communication, and promotional, or simply to promote products and services that would be difficult to market in-store for short periods or to customers who rarely visit the town centre. The adoption of electronic commerce by town centre retailers represent a simple solution able to sell products also in a virtual world. Nowadays the number of purchase online constantly growth, and more and more people prefer to buy from home, and retailers cannot disregard this trend [17,23].

2.2. Commerce via mobile devices: M-commerce

With the advent of wireless networks, the rapid proliferation of mobile devices in recent years, and the demand for associated value-added services [15, 26, 27], the area of mobile commerce has also emerged as part of the retail world [28,29,27]. The emergence of this new mode of commerce is particularly related to the growing number of consumers with smartphones or other Internet-capable mobile devices [29]. In recent years, consumers have thus acquired another way to access worldwide information about products or services from anywhere and at any time [30,26], and consequently have another way to conduct electronic business transactions [31,32,33]. M-commerce can be considered an extension of e-commerce [28, 29,27] and it is a mode of commerce that retailers within town centres consider and learn to integrate with traditional retail. The main advantages that m-commerce offer are mobility and broad reach. Mobility, in particular, implies that people can purchase something through their mobile devices and that they can be reached at any time via a mobile device [34]. Town centre retailers have to exploit, in the best possible way, the potential offered by m-commerce to connect their online presence and fixed store using new technologies. M-commerce could help retailers combine the strengths of e-commerce and traditional shopping, connecting the virtual and physical world to interact with clients.

2.3. Commerce via social sharing: S-commerce

Social commerce (S-commerce) can be defined as word-of-mouth applied to e-commerce [35, 36]. According to Robleck et al. [37], s-commerce allows people to

share opinions, and it changes the way people shop, creating a more open and connected world. For this reason, town centre retailers have to redesign their commerce strategy in a way that connects e-commerce with social media tools to create new types of connections. Through s-commerce, consumers can interact [38] while shopping [39], and even take a compatibility test to find their "shopping soul mate" with similar shopping tastes ([39]. Modern consumers have become active producers of content over the Internet [4] and are no longer passive, as in the past. Social interaction [38] has become the predominant element in the s-commerce process, and the creation of relationships between consumers is now what drives the conversation: consumers are signalling the way that businesses must follow. Customers are increasingly familiarizing themselves with social media and retailers cannot ignore this phenomenon. S-commerce is the evolution of online commerce and can represent the soul of the aggregation of economic activity in a town centre. Through the use of social networking platforms, an online purchase is only the formal conclusion of a long process of socialization, communication, and exchange of information that goes beyond the single purchase.

3 Towards Smart Town Centre Model

Elements considered within the model represent a set of innovative tools in the retail sector, but there is not a broad application of these from town centre retailers. In particular, e-commerce, m-commerce, and s-commerce, which represent hypotheses (H1), (H2), and (H3) within the model, were widely considered by scholars [29, 22, 37] as relevant for the retail sector. To create a more attractive place for people and offer them an amazing town centre experience, it is necessary to implement other hypotheses in the model. In particular, the digital solutions explained below can be considered interesting solutions for the town centre revitalization by which town centre retailers can create a place where people – citizens, tourists, and investors – can live a more immersive experience.

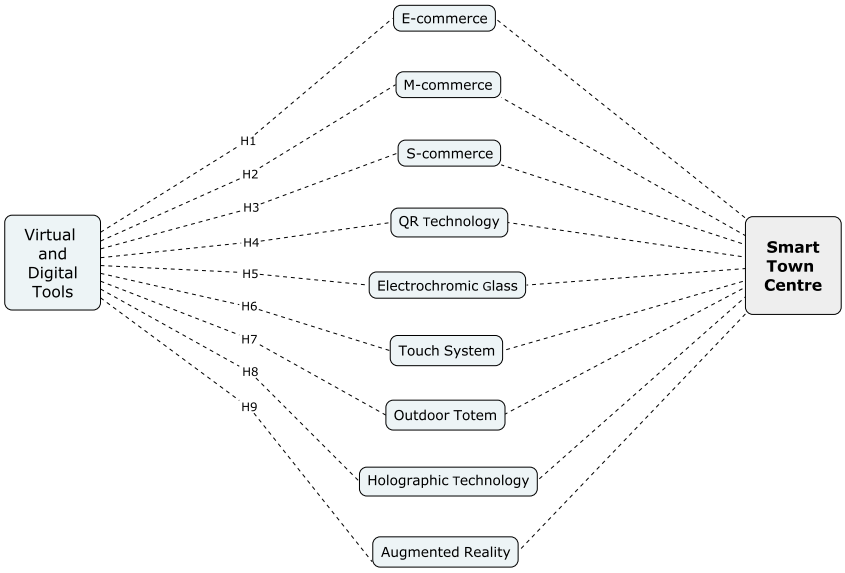

Fig. 2. A Smart Town Centre Model (Source: Authors elaboration with CmapTools)

H4. Quick Response Technology

QR is a technology that permits the implementation of technologies such as bar-coding and scanning, and through a QR code, retailers can obtain profits in return for delivering satisfaction through improved store attributes [40]. QR could realistically be part of a retail strategy for town centre shops. To achieve the goal of having better operational efficiency and retaining effectiveness, QR could be a critical element of a retail strategy in smart town centre shops. Shops in the town centre that possess QR technology have the possibility to connect the physical shop to the virtual world via mobile devices. In other words, QRT technology can be considered a tool that helps retailers connect their physical store to the world of e-commerce.

H5. Electrochromic glass

Electrochromic (EC) glass is a special kind of glass composed of components that integrate chromogenic materials able to change, in a dynamic and reversible way, their optical characteristics as a function of the exterior environmental conditions or the interior comfort needs [41]. This glass makes the best of physical – chemical features of some materials able to change physical state, from highly transparent to partially reflective. Particularly, EC glass contains multiple layers of materials, generally metallic oxide that changes chromatic characteristic as a function of the passage of a weak electric field. The activation of the electric field induces an oxidation-reduction reaction, which produces a colour change in the film passing

from fully clear state (OFF) to the fully tinted state (ON). This change leaves the transparency of the glass slab so the visibility and the relation to the outside are also preserved when the glass is fully tinted. The variation occurs over a period of time, ranging from three to ten minutes, based on the glass size and the condition and temperature at the boundary [42]. The activation is manually performed with the use of a switch, or through an automated system of building management and control (domotic system). The production offers a chromatic choice that, as a function of the metallic oxides being used, is able to obtain, in the ON state, various colours like blue, green, and brown. Through the use of EC glass windows, retailers within town centre can create specific strategies by using the same colours for commercial events or using the same colour to attract a specific kind of people.

H6. Touch System

The touch system technology is an innovative solution that can be useful for any kind of business but particularly for town centre retailers. The touch technology is an interactive tool for collaborative work environments. People can view images seamlessly on multiple displays, which they can combine as they like to create their own personal solution. Town centre retailers that adopt touch windows can customize the shopping experience for their customers. With touch technology inside the shop window, people can explore the shop and interact with multimedia content on extremely large touch surfaces and have an interactive, dynamic, and engaging multi-touch experience without ever going inside. Touch technology allows retailers to focusing on the user experience, to allow anyone to create, view, communicate, organise, and share anything from documents to images and videos. A touch window integrated in the traditional town centre shop can focus entirely on how people search and share visual information, allowing people to share content in a digital, interactive, exciting, and stimulating space. On the one hand, town centre retailers can get their clients involved, promoting and collaborating. On the other hand, this technology allows retailers to other promote an interactive technological experience to boost, improve, and accelerate sales processes.

H7. Outdoor Totem

The outdoor totem can be considered a new way to communicate, see, hear, and touch within the town centre. In particular, this kind of technology implemented in the commercial street could be a great device to create paths of digital information. The contents, sounds, images, and interactive interfaces are automatically activated when customers pass. By activating the touch screen display, users can search for information; surf the web; view pictures and video; or explore the interactive city map. Such technology allows retailers to create information points to connect with customers, other information points, and tourist information for any kind of human traffic. The interactivity allows town centre retailers to create truly interactive information points where content, information, pictures, and videos are at the complete disposal of users.

H8. Holographic Technology
The holographic technology is composed of a transparent glass on which multimedia contents are projected. This technology can by integrated into the retailers window within the town centre and users can interact with digital content, browse catalogues, watch videos, and surf the Internet. It is an extremely exciting activity with a high visual impact. Through holographic technology, images are projected on a completely transparent touch glass. The screen is, in fact, composed of thousands of holographic prisms receiving light from the projector. Images are evenly redirected to the viewer, offering sharp and crisp quality to create a exciting and spectacular three-dimensional effect [43]. This technology allows retailers to create a touch information point where visitors can interact, through simple gestures and natural hands movement, with digital content, and then send the chosen files via e-mail or make direct transfers to their smartphones. It's a great device to capture visitors' attention on a town centre street to develop a smart high street.

H9. Augmented Reality
Augmented reality is a system that supplements the real world with virtual (computer-generated) objects that appear to coexist in the same space as the real world. This kind of technology permits a combination of real and virtual objects in a real environment; runs interactively and in real time; and registers (aligns) real and virtual objects with each other [44].. The augmented reality is able to create a new kind of environment for the revitalization of the town centre and retailing by matching data generated by a computer into the user's view of the real world [45]. By using augmented reality, it is possible to create an immersive experience within the town centre inasmuch as this technology allows the user to see the real world with virtual objects composited within the real world. Through this technology, people visiting a smart town centre can stay in a physical space but live a more intense and interesting new experience where the physical and digital worlds are fused together. The augmented reality contributes to creating a smart town centre where people can stay together and interact with the elements and infrastructure that constitute this urban space. The combination between real and virtual worlds creates a new dimension to experience the town centre in a new way, providing the possibility for people to interact in real time and live a new experience in three dimensions.

4 Conclusions

The smart town centre model represents a combination of several elements that are normally used alone. In fact, we proposed a blend of these elements that, through a systemic approach [46], can increase the intrinsic value of a traditional town centre, transforming it into a smart town centre. From the combination of these technologies is born a smart town centre as a place where people are completely involved in the urban place and where they go from being passive spectators to active members of a thriving space. Each of the elements analysed here have been used in the commercial or business world, but it is their combination together that creates new value for the

town centre, creating a smart town centre that is capable of offering visitors an immersive experience.

The strength of this model is based on the combination of several kinds of digital commerce and digital tools applied to the town centre, transforming it into a smart town centre. The effects that can emerge from the application of this model have two important advantages. First, such a transformation makes it possible to overcome the impoverishment of traditional town centre with a vibrant revitalization of this urban area. Second, this model creates an amazing and emotional experience for people – citizens, tourists, and investors – that spend time in the town centre.

This paper is a result of a research project conducted by the Economic and Business Science Department and Civil-Environmental Engineering and Architecture Department. The collaboration of these departments was integrated with the support of Council of Cagliari and Sardinia Region in order to realize a field test in some historic streets of the Cagliari town centre.

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The role of the mobile application in the public transport systems

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Abstract. This study analyzes the role of the mobile application for improving of the service reliability in public transport systems. Service reliability is considered as a very important aspect for transit users, and it is one of the most examined transit service aspects. The usability of public transit can be increased by offering good traveler information systems. This study focused on Gira Napoli application that provides real-time information about bus of the city of Napoli. Through interviews at the Gira Napoli users, the analysis shows that dimensions such as ease of finding information, ease of GUI, ease to use in all condition and truthfulness of information have a key role in promoting Gira Napoli usage and thus service reliability.

Keywords: e-government, mobile application, public transport systems.

1 Introduction

Governments around the globe are trying to provide e-government, online products and services to all citizens of their countries. This is an effect of New Public Management (NPM). The bulk of the studies describe the transition from Public Administration to NPM like the need ofmaximizing user satisfaction and efficiency at the expense of formal aspects and legal rules [1].

The main objectives of New Public Management are improving service through the balance between two dimensions: objective (time, cost, quality) and subjective (equity, social and territorial inclusion) [2].

Boyne says: “the main purpose of the public service is to elevate the standard of living although it could worsen the effectiveness and efficiency of providers” [3]. The increase of public service is a dynamic concept, it is related to equity problem, and it expresses the performance of the networks of numerous actors.

This study focuses on the issue of mobile application quality in the public transport. It goes on to consider the measures of mobile application quality that have been identified in various literatures to date.

In Public Transport organizational effectiveness and the public service improvement are not always in contrast because through the market mechanism, objective and risks become clearer [4].The elimination of regulatory restrictions and free choice for companies (price tickets, run time and route) are decisive for eliminate

unnecessary expenses and encouraging innovation and market growth. The risk of losing invested capital leads to orient the goals towards consumers, this increases supply and public service improvement.

At the base of these theories there is an approach for continuous reduction in costs of quality services and delineate the elements for increased market demand [5]. In view of this consideration, the focus of NPM is on managerial problems of public companies. In this case the public transport companies are not instruments for achieving the public interest but companies that adopt a rational process to use scarce resources [6].

The bulk of the studies on public transport agree that service reliability is a key variable to extend the customer satisfaction, Turnquist and Blume define transit service reliability as "the ability of the transit system to adhere to a schedule or maintain regular headways and consistent travel time" [7].

The aim of this paper is to know if the mobile application can improve the usability of public transit systems. Using a qualitative research methodology, this study analyzed the case Azienda Napoletana Mobilità Spa that developed Gira Napoli mobile application.

The structure of this paper is as follows. In the next section, it proposes the literature review on e-government, e-service and a generic framework for usability testing of mobile applications, and then it deepens the relation between e-service and service reliability and the rules of mobile applications (section 3). In section 4, it describes the research methodology and the results of the analysis. Finally, in section 5 it presents the discussion, conclusions, limitations and future directions.

2 Literature review

2.1. E-government in the transit system.

There are various definitions of e-government used within research, Carter and Belanger support: "E-government is the use of information technology, especially telecommunications, to enable and improve the efficiency with which government service and information are provided to citizens, employees, business, and government agencies" [8]. The aim is to deliver high-quality public service, offering the citizens elements able to satisfy their needs, in fact, Government has invested many resources like time and human resource.

Lenk and Traumüller point out that e-government was created as a term after e-commerce that, however, has nothing at all to sell with it, but it is linked to the evolution social of the citizens, that they are ready to use Internet for meet their needs, then the e-government may be a subset of e-commerce [9].

Similar to Belanger is Fang's conception: "one of the most important aspects of e-government is how it brings citizens and business closer to their governments", the same author starting from this definition outlines a triangle relationship model among government, business, and citizens, coming to the conclusion that e-commerce is a holistic system connected to the area of e-commerce in the e-society [10].

If the e-government is a subject of e-commerce, there are more difference between e-service and e-public service, for Boyer the e-service is the initial landing on the home page until the requested service has been completed or the final product has been delivered and is it fit for use [11], while e-public service means the provision of public services by electronic media, in most cases, are the information and communication; in this case data quality is very important for intra-organizational usage and for reports to different stakeholders [12].

Van Dijkand Hacker differentiate four types of access namely psychological, material, skills, and usage access, the last raises the issue of usability that is associated with research on diffusion [13]. Usability factors appear to simplify the issue of the digital divide and other socio-economic factors that create the divide like income, age, culture [14].

For the purposes of this study are not important the analysis of the major author relative at people disadvantaged by e-service because the investigations have been made in an industrialized country, but for further details see Cullen's works [15].

Wichansky says that an effective usability test has to be able to give feedback from users about ease of use and performance, but it is difficult to foresee the exact situation of the application use [16].

There is two major methodologies utilized for usability testing, and they are laboratory experiments and field studies [16], they have pros and cons, the choice depends on the goal it wants to achieve. The first difference is the environmental factors.

Mobile application tested in laboratory allows to understand user feedback when using an application, instead field studies allow to deduce usability problems.

The more research on laboratory experiment are of Bautsch-Vtense (2001), Kim & Albers (2001), and Parush and Yuviler-Gavish (2004), while on the field study are Kim (2002), Palern and Salzman (2002), Rakkolainena and Vainio (2001) [16].

2.2. The relationship between e-service and service reliability

Transit service reliability is defined as "the ability of the transit system to adhere to a schedule or maintain regular headways and consistent travel time" [17]. The indicator is generally calculated as the ratio of the number of runs that come on time to the number of total runs, but there are also other indicators to be considered like on-time performance, running times and the waiting times.

For more clarification see the studies done from Eboli and Mazzulla [18] that reflect all the authors who have analyzed the phenomenon in the past decade, between these there are El-Geneidy (2007) that introduced a regression model for estimating the amount of time it takes a bus to travel along its route, and the variables utilized are number of signalized intersections, number of passenger boarding or alighting, departure delay, stop delay time [19].

A subset of the service reliability is the information, the problem experienced by many users occurs when companies change schedules or routes and do not provide information to customers[18].

As It has mentioned in the introductory notes, the problem of citizens is characterized by the uncertainty of when the transport will arrive, service quality is perceived as an important determinant relative at the choice of the use of public transport or private car. In this context are relevant psychological factors like lifestyle, attitudes, and the habits.

Recent studies like Beirão and Cabral (2007) show that service reliability is the main focus of the choice, the people need reliable information, the wait at the bus stop is perceived as a cost [20].

Governments should see the citizen as a success variable [1;3], in this reading is very important the application mobile, because the people can find the information relative at public transport on Internet by our mobile.

The intangibility of the service makes difficult the perception of the people, from the study mentioned above [8; 9; 10; 11] it can be calculated as the difference between the expectations and the result obtained.

The achieving a high level of user satisfaction is crucial to the success of mobile application and to e-service [16], this is the second reason for the survey; in this case the elements to consider are the following: the ease of finding information; the ease of graphical user interface (if the menu is intuitive); ease of use in all conditions (on the bus, on the road).

3 Research methodology

The aim of this paper is to know if the mobile application can improve the usability of public transit systems. Using a qualitative research methodology, this study analyzed the case Azienda Napoletana Mobilità Spa (ANM) that developed Gira Napoli mobile application.

ANM is a municipally controlled public company. It is the primary provider of urban public transportation in the city of Naples. It also provides a portion of the surface transit service in surrounding municipalities. ANM was formed on 1 July 1995. The company provides some bus service to areas outside the city of Naples proper. The ANM's service connecting also airport of Naples with the city center. The bus is called "Alibus".

Gira Napoli is mobile application that provides real-time information on transport service. It allows you to: locate the bus stop, display routes, know the waiting time at the bus stop. The application has been developed for all mobile device, Android and Apple. It can be downloaded for free. Gira Napoli has some innovative features. It allows you to view on a map of the bus route. The bus stops on way out are blue, while those returning are red. In the forecast screen shows all lines which pass into bus stop (it is necessary activate the GPS mobile phone).

The analysis is based on 135 structured interviews with general public, including regular and occasional Gira Napoli users.

The sample was stratified by age, gender and transport usage. The respondents' age ranged from 18 to 70 divided in three age range (18-30; 31-50; over 50). Transport usage is related at three categories: leisure, work and study. In addition, the

participants had to live different geographical locations in the metropolitan area of Napoli.

Two types of questionnaire dissemination channels were selected for this study, Internet and self administered questionnaires.

It was used Google Forms for the internet questionnaire. The link to the online questionnaire was sent out by e-mail to a total of 120 people which included many individuals, since the research was focused on individual users which utilized the Mobile Application. The survey has been restricted to citizens used it. Google Forms was chosen as the online survey due to its popularity and easy of use. This was a quick and convenient way for obtaining data from many respondents simultaneously.

The questionnaires that were distributed contained ten questions, broadly classified into three categories as follows.

Three demographic: "What is your gender?"; "What is your age?"; "Why use the public transport?".

Three relative at Service Reliability in public transport (SR): "I take the bus because I prefer it to the private car"; "Before using the mobile application you were satisfied with the public transport?"; "After using the application you were satisfied with the public transport?".

Four relative at Usability Testing of Mobile Application (UTMA): "the search for information is easy"; "The graphical user interface is easy and intuitive"; "it is easy to use the application in any context (for example with rain, sun, on the bus, on the road…)"; "the information is truthful".

Table 1. Profiles: interview participants

Demographic Categories	**Age Range**			**Total**
	18-30	*31-50*	*Over 50*	
Gender				
Male	25	24	15	**64**
Female	20	21	30	**71**
Transport usage				
Leisure	10	6	30	**46**
Work	5	37	15	**57**
Study	30	2	0	**32**
Total	**45**	**45**	**45**	**135**

Table 1 shows the profile of sampling as said previously. It is differentiated, for every age range there are 45 users. The incidence of transport usage is similar in leisure and work, the study category is lower than other because in Italy the people that studying are mainly the age range 18-31.

4 Result

Table 2. Survey's results.

Categories	Age Range			Average
	18-30	31-50	Over 50	
Service Reliability				
The bus preference over the private car	30%	45%	70%	48,33%
Satisfaction before mobile application	70%	65%	60%	65%
Satisfaction after mobile application	80%	70%	50%	66,66%
Usability Testing of Mobile Application				
Ease of finding information	80%	65%	45%	63,33%
Ease of GUI	90%	65%	40%	66,66%
Ease of all condition	95%	70%	35%	66,66%
Truthfulness of information	80%	80%	80%	80%

Table 2 shows the survey's results. The 48,33% of respondents prefer the use of the private car. The higher number is in age range 18-30. The choice of transport is influenced by several factors, such as individual characteristics and lifestyle. This data confirms the research cited above.

It asked survey respondents whether their overall satisfaction with public transit had changed as a result of using Gira Napoli. The results show an positive change but very low. The increase is 1,66%. The stratification of the sample was very important because it has allowed us to understand that the problem is in the digital divide. In fact in the other two age range the increase is respectively 10% and 5%.

It also asked respondents the ease of finding information. In this case as previously there is a significant difference between age range 18-30 (80%) and over 50 (45%). It has decreased the average drastically (63,33%).

The data are similar in ease of GUI and the ease to use in all condition, the average is 66,66%.

This study show that the application Gira Napoli offers true information, in fact at question: "the information offered by Gira Napoli are true?", 80% gave a positive opinion.

5 Conclusions

The aim of this paper is to know if the mobile application can improve the usability of public transit systems. Using a qualitative research methodology, this study analyzed the case Azienda Napoletana Mobilità Spa that developed Gira Napoli mobile application.

Internet has transformed the mainstream activities of people's live; changing the way people live and work. People who do not have this benefits fall in digital divided [14].

The result of this survey are that respondents have on overall increase in satisfaction with public transit, but it is very low.

The causes are found in the digital divide. Indeed it is one of barriers of Internet usage by the elderly. However recent study showed a growth in accessibility of the internet by all ages including the elderly [14]. This growth could be attributed to factors such as a need to communicate with families abroad and hobbies.

The outcomes are all positive in terms of increasing for the two age range (18-30; 31-50), negative or very low are only in age range over 50.

The difference between before and after the use of Gira Napoli are negative, and this is a result of digital divide.

The increase of the usability of public transit system is a driver of creating value for the citizens. It is a subject of service reliability. Real-time arrival information are tolls for increasing the perception of reliability [19].

Regarding relationship between satisfaction and wait time, the overall satisfaction with public transport is related with decreased wait time [20].

The ease of finding information should be at 90%, from the questionnaire, the data is 63,33%. The information there are but it is not easy to find all.

The ease of GUI should be expected. The main problem of Gira Napoli is the overlapping of the lines on the map. This confuses the citizen.

The mobile application should be consulted in any condition, for this reason it was decided to do a filed study.

The field study are appropriate for studying user behaviour and attitude toward mobile applications.

The real-time information used by Gira Napoli is definitely not 100% accurate. There are a number of factors such as traffic or area work in progress, but in the future the application programmers want to connect Gira Napoli in Google maps. The purpose is to have a real view of the territory.

There are limitation to this paper, for instance it was very difficult to get many more people of 70 years and above the participate in the research, because many were uninterested in discussions relating to computers or technology [19].

Maybe for to understand the problems connected at age range over 50 it is important make a second data collection, which combines both subjective and objective indicators, by taking into account passenger perceptions and performance measures.

These data are not encouraging. Future work should be enlarge the reference sample or make a comparison between a city from north of Italy. However they could

be a road map for Azienda Napoletana Mobilità Spa. The benefits related to investments can exceed costs.

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Are social media an opportunity for women entrepreneurs? A literature review

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Abstract. This paper presents a literature review on businesswomen and social media. Its aim is to know the current state of knowledge on this topic and understand whether and to what extent studies conducted so far have addressed these issues: how and why businesswomen are using social media? In order to answer these research questions a literature search on Scopus has been conducted, using a set of selected keywords. Selected papers have been analyzed and classified, in an attempt to identify main topics and results obtained so far. This paper contributes to expand the literature on women in business. Our literature review confirms that the use of social media by women in business is a new issue, which offers the possibility to identify new trends and future directions for research. The major implication is to advance knowledge and practice in the area of gender in management and use of social media by focusing upon empirical research, theoretical developments and current issues.

Keywords – women entrepreneurs, women manager, big data, ICT, social media

1 Introduction

Web-based technologies and digital culture have become an important part of our daily activities and this topic is at the top in the agenda of many researchers and policy makers. Social media are computer-mediated tools that allow people or companies to create, share, or exchange information, career interests, ideas, and pictures/videos in virtual communities and networks. They introduce substantial and pervasive changes to communication between businesses, organizations, communities, and individuals. In particular, social media can make possible new ways of working and doing business, based on innovative concepts such as sharing, collaboration and co-creation.

Social media can open up new opportunities for female entrepreneurs and encourage the creation of new businesses run by women, thanks to their flexibility and their features. Moreover, social media can support women in business to express their capabilities in networking by building virtual communities. Finally, social media can be seen as a means to take care of personal relationships, which can be relevant for women in business that in most cases have to balance their private life responsibilities with work commitments. However, the use of social media by women in business is a little-known topic, with still unknown implications on management and organization. As a matter of fact, while a number of analysis and research exist about women in business and social media, few authors have mixed these topics. For this reason, it is important to understand how social media can really facilitate, promote, and support women in business, and if the latter are able to take full advantage of them.

On the light of these premises, our research questions are the following:

- How and why women in business (i.e. female entrepreneurs and women managers) are using social media?
- Do they use social media for marketing, networking, or personal reasons?

Our search strategy shows that very few papers deal with the use of social media by women in business, and they all refer to developing economies. So the impact of social media for women in business working in these areas are discussed, taking into account the specific features of the cultural, social and economic context of these countries.

This paper contributes to expand the literature on gender studies and it offers a new perspective applied to a topic of high relevance. Our literature review puts in evidence that there is a lack of research on the use of social media by women in business, which gives us the possibility to identify future directions for investigation. The major practical implication is to advance knowledge in the area of gender in management by reconsidering communication and networking activities using social media.

The remainder of the paper is structured as it follows: in section 2, the method of the literature review is set out. Next, the findings of the review are shown in section 3. Implications for future research and conclusions are presented in section 4.

2 Methodology

2.1. The research protocol

With the aim to draw a literature review about women entrepreneurs/managers and social media, we decided to search for academic contributions on the Scopus database. Scopus, in fact, is a bibliographic database containing abstracts and citations for academic journal articles. It covers nearly 22,000 titles from over 5,000 publishers, of which 20,000 are peer-reviewed journals in the scientific, technical, medical, and social sciences. Our research protocol concerned:

- *selection of key words* to find papers through the Scopus searching engine. To this end, we combined the words “social media” together with different search

terms: gender or entrepreneur(s) or manager (s) or woman/women/female entrepreneur(s) or woman/women/female manager(s);

- *definition of the subject area*, as the social media phenomenon interests researchers from different research fields: life sciences, health science, physical sciences and social sciences. Our investigation addresses the topic of women in business and social media, then we limited our search to the Scopus Social Sciences & Humanities database, which covers more than 5,300 titles;
- *definition of the data range time-period of publishing*. We included in our analysis papers published since 2010, as social media are quite a recent phenomenon, which is continually evolving. As a matter of fact, the most known social media have been created about ten years ago: namely Facebook was launched in 2004, Myspace in 2004, LinkedIn in 2003, YouTube in 2005 and Twitter in 2006;
- *perspective/model/framework to adopt* for analyzing selected documents. The framework to analyze the papers is related to our research questions and therefore, the content of the papers was examined and discussed addressing how and why women in business use social media.

A double level of analysis was adopted. As literature on gender underscores, behaviour of women in business is often driven by the needs of combining private and personal life with work commitments (work-life balance) [1][2][3]. Accordingly, we are interested in analyzing the use of social media by business women, as an individual, and by firms where women run leadership roles, as an entrepreneurs or managers. For instance, as shown in Table 1, we have addressed both the use of social media by business women in their private life (e.g. to maintain social contacts; to improve work-life balance; to share personnel opinions; etc.) and in their organization (e.g. to wide social network in the business; to promote product or brand; to involve clients or potentials customers in product innovation; to promote employee collaboration and networking, etc.).

Table 1. The use of social media by women in business (examples)

	Individual level	*Organization level*
How	Use of FB chat	Building an external community of followers on social media (i.e. FB, Twitter; etc.)
Why (expected benefits)	To maintain social contacts and to improve the work-life balance	To obtain feedback from customers or potential customers on new products

2.2. The dataset

Hereinafter we explain how we created the paper dataset with reference to the number of articles, the type of journals, and the nationality of the authors.

At first, we used the search terms “social media” and “gender” to be found in article title, abstract or key words of different document types (articles, books or book chapters), published from 2010 to present in the Scopus Social Sciences &

Humanities database (search was made on 15-02-16). 500 papers of very heterogeneous content were extracted. Those papers address the use of social media in a variety of contexts and none of them explores the use of social media by women in business. We found, actually, that using "gender" as search term, we selected a lot of empirical studies on the use of social media in which the variable gender (male or female), as well as other demographic and socio-economic variables (e.g. age, education, profession, nationality, income, etc.), are used to describe or predict specific investigated phenomena. We therefore decided to restrict the scope of our research to the use of social media by managers and entrepreneurs.

With the aim to get a picture of the current state of knowledge on this literature and to draw a framework to be used later to better focus on the specificities linked to gender, we decided to use two search terms, connected by the Boolean operator "and": "social media" and "entrepreneur" (or "manager"). In the first case, we got 56 documents, of which 29 specifically related to the business, management and accounting research fields. In the second case, 425 papers were extracted, of which 250 belong to the business management and accounting area. To focus our analysis on the most relevant academic contributions, we identified papers that had gained five or more citations. As a whole, the result was equal to 62 papers. Then, we downloaded all the selected papers and we classified them on an Excel sheet, highlighting the following factors: (i) journals where they were published; (ii) number of citations; (iii) authors' nationality. Moreover, we analysed each paper to figure out the different uses of social media, the expected benefits and possible obstacles associated with their use. In short, results show that a large part of those papers is written by US authors (more than 50%) and is published in specialist journals (e.g. Journal of interactive Marketing; Journal of Research in interactive marketing; Public Relations Review) or in generalist journals of management, which are not characterised by a high academic impact (with some exceptions like Business Horizons). The most recurring topic is about the use of social media and its related implication on marketing / advertising issues, followed by social media and networking (with different kind of stakeholders and communities) and social media and innovation.

Finally, we focused on the literature concerning the use of social media by women managers and entrepreneurs. Accordingly, we selected papers containing two search terms, connected by the Boolean operator "and": 1) "social media"; 2) "woman entrepreneur" (or "female entrepreneur" or "woman manager"). Search terms had to be found in article title, abstract or key words of different document types (articles, books or book chapters), published from 2010 to present, in the Scopus Social Sciences & Humanities database. Only five papers were found. This is surprisingly and it suddenly highlighted a tremendous lack of research in this specific field. Furthermore, all articles focus on women entrepreneurs in emerging countries (i.e. Indonesia, Egypt, and Kenya) and they are written by women scholars living in the same regions.

Based on the survey results, it appears that even if research on social media in the enterprise present a large number of studies, they are mainly descriptive and do not present consolidated interpretative models. We are still at an early stage of research, as demonstrated by the fact that most of the papers are published in specialist

journals, while a few articles have been published in high-ranking journals (see table 2).

Table 2. The data set of selected documents

Key words	No. of documents extracted	Nationality of authors	Journals
Social media and Entrepreneur /manager	62	The majority of authors is from USA (50%) and UK (18%)	Most articles are published in specialist journals
Social media and woman entrepreneur /manager	5	Emerging countries	Mediterranean Journal of Social Sciences; International Journal of Entrepreneurship and Small Business; International Journal of Gender and Entrepreneurship

A thorough review of such articles in light of our search queries follows in the next paragraph.

3 Main findings

3.1. Social media as a challenge for management

As shown in Table 2, in the first group 62 papers were extracted. They generally refer to entrepreneurs and managers with no particular gender characterization and analyze the use of social media by companies as well as their impact and implications in different business contexts. For the purpose of our research it is important to note that none of these articles investigate how personal characteristics of entrepreneur / manager can impact on the use of social media by companies. Nor it is taken into account the individual level of analysis, which is related to what are the personal and professional benefits that managers/ entrepreneurs can obtain from the use of social media. So these first group of papers do not provide any useful information to answer our research questions, as the use of social media is not specifically related to women in business and no comparison is presented between men and women.

All papers focus on the use of social media at the organizational level. Papers refer to a large range of firms as regards to model of business adopted, dimension, industry, country. Accordingly, current research in this area reflects the different stage of adoption in which organizations are working to identify uses and evaluate success factors for online social networks and virtual communities. All researchers agree that social media is a broad term that describes software tools that create user-generated content that can be shared, while social media technologies include social network web sites, blogs, wikis as well as online photo and video sharing sites ([4][5]. It is evident the great impact of these technologies to allow consumers to share

experiences and information on products, services, companies and brands and how this shifts the power to influence customer's behavior from organizations to consumers. As a consequence, the phenomenon has suddenly caught the attention of scholars interested in its implication on company marketing and advertising. In this field, researchers' mainly investigate how companies interact with virtual communities [6][7][8][9][10][11] and for what purposes [12][13][14][15].

Only a few papers address the adoption of social media by organizations from a strategic perspective. The latter underlines how social media can successfully be managed to gain competitive advantages in the short and/or in a medium run by adopting conscious initiatives and proactive behavior [16][4][17][18]. To this end, interesting insights can be found in the paper of Sinclair and Vogus [4]. It presents a survey on how 72 top global companies are using social media. In detail, following uses and related expected benefits arose (p. 300):

- promote a company, product or brand (in 100% of the companies analyzed);
- build external communities of followers (90%). This initiative aims at linking to a group of customers who purchase products and services and are willing to share product and service experiences with others;
- build brand loyalty (60%);
- build internal communities of followers (18%), with employees or other groups;
- educate customers on specific topics or technologies (7%). These actions aims at facilitating new products and directions for the organization;
- promote a social cause (7%). These actions reflect a company's interest in issues of concern to our society;
- for product improvement or product development (7%). This use of social media aims at soliciting input or feedback from customers or potential customers on new products or products that are under development;
- defend the company against attacks (7%).

As a result, this study shows that there is an increased use of social media by organizations. Use of social media is both passive and active, both tactical and strategic.

Moreover, it should be highlighted that in the last years there has been an increased awareness of the relevance of social media for the following two reasons:

- social networking give consumers a voice over design, product/service promotion and support. Companies can gather information from social networking and virtual communities and creating value for customers [19];
- as there is a young generation which is digital born and very social-networking-active, manager are aware that the use of social media is vital to communicate with the younger consumers [20][21].

Finally, for the purpose of our research, we deem that it is also important to highlight that the adoption of social networking sites varies depending on contingent factors that distinguish the firm (i.e. its size, the sector in which it operates, the geographical location, cultural and socio-economic factors featuring the environment in which the company operates) [17].

3.2. Social media in emerging countries: implications for women entrepreneurship

As previously noted, the second phase of our research was carried out using two search terms: "social media" and "woman (or female) entrepreneur / manager". These search terms had to be found simultaneously in selected papers.

On the basis of this search strategy, only five papers have been extracted that contain both these search terms. Surprisingly, none of the paper refers to developed economies. The common feature of these papers is that they concern women entrepreneurs in emerging economies, mainly Kenya, Indonesia, Nigeria, Egypt, South Africa. The same characteristic also distinguishes the authors, coming from the same emerging countries. This distinctive feature may explain the approach adopted in analyzing implications associated with the use of social media by women entrepreneurs, as well as the main themes emerging from these analyses. In fact, women's subordination, marginalization and lack of inclusion in the analyzed countries explain social media's impact for women entrepreneurs.

In these papers, attention is not directed only to business aspects, that is the impact of social media on business organization, competitive strategies, logistic, relationship with customers, suppliers and other stakeholders, marketing and communication strategies, etc. On the contrary, analyses are extended to women entrepreneurs' personal dimension, that is to social media's impact on women entrepreneurs' private and family life, their social interactions and, more generally, their role in their social context. All the papers highlight the deep impact of internet and social media on women's lives in these countries, as they have now the opportunity not only to start a business, but also to redefine their role in society. Upkere *et al*. [22][23] emphasize that in Africa many women entrepreneurs have used social media to launch informal businesses, later converted into formal businesses, by reinvesting profits earned in the informal phase. According to the authors, women entrepreneurs' ability to take advantage of social media can result from their greater propensity to adopt a community-based approach and to maintain social relationships, and to their greater propensity to interact with customers and perceive their needs. This is why social media exert a particularly strong impact on women, since the latter are better able to glimpse potentialities of social media and to take advantage of them. Authors also emphasize women's willingness to get rid of the stereotype that considers them technology averse and little able to use it. Precisely this desire is the basis of some successful projects, such as Women Weavers Online, a network of Moroccan women [23] who have the possibility to sell their handworks online, even if they live in very remote villages. In Melissa, *et al.* [24][25] and in [26], empowerment is the central theme of analysis. It is defined as a process of change that occurs as women's gradual emancipation from a position of marginality and subordination and as a strengthening of their role in the social context. The concept of empowerment is linked also to that of "human agency", defined as women's freedom to make their own choices without fear of their consequences. It is also interesting to note that analyses about empowerment refer not only to the social context in general, but also to women's role within their family.

The ability of social media to generate such empowerment effect on women entrepreneurs is mainly due to social media ability to support the creation of online communities and social networks. Melissa *et al.* [24] analyze social media effects for Indonesian women's empowerment. Actually social media:

- have encouraged women to undertake an entrepreneurial experience: several activities in fact have been launched to offer for sale on line manufactured products that women till then only used to post on Facebook. Social media have allowed women to perceive a business opportunity and convinced them of the possibility to gain profit from their homemade products;
- have made possible to start a business with extremely low investments and operating costs. Cases observed by the authors, in fact, are mainly home-based business, selling online homemade products or services;
- have allowed women to implement, or maintain, a network of social contacts also if they were forced at home to take care of their family. This has reduced their isolation and has significantly enriched their social life;
- have enabled women to have greater financial resources, and therefore to enjoy more freedom and financial autonomy. Thanks to their own income, women can now contribute to the family welfare not only as caregivers, opposed to the breadwinner role of their husbands;
- have enabled women to redefine their role within their family, to acquire greater importance and to actively participate in decision-making, thanks to their contribution to family income;
- have enabled women to realize themselves and redefine their role in the society.

As regards business activities, Upkere *et al.* [23] highlight advantages that social media can offer women entrepreneurs:

- low start-up and running costs: to sell online handmade products or services women only requires a smartphone to post pictures and to manage payments;
- low competences: because women's business are very simple and a basic technological literacy is enough to manage them;
- wider social networks: thanks to social media women entrepreneurs can build a broad network of contacts and increase business visibility;
- better work-life balance: women can also involve family members in their home-based business [24][25].

Overall, these papers show an integrated vision of female life experience. Issues concerning private, family, social and professional life are not considered separately, but they converge to form a single picture of women's life experience. Actually social media can have a major impact in various aspects of women's lives:

- in family life, social media help to increase women's negotiating power;
- in social life, they favor women inclusion and enable a more active and productive participation in social life;
- in professional life, social media help starting a business using women's expertise, with low costs and investments and
- in private life social media promote women self realization, enhance their skills, and help women to satisfy their ambitions, while obtaining a financial reward.

3.3. Discussion

The literature review provides some insight about the relationship between women in business and social media and it offers some suggestions to define a research agenda in this area:

1. the role of social media as a relationship management tool is central in the analyzes on this topic;
2. literature on social media and entrepreneur / manager does not focus on the use of social media at an individual level and in private life networks. In most of the analyzed papers, attention is focused on business relationships and networks;
3. literature focused on "social media and woman entrepreneur" emphasizes the deep intertwining between personal and business relationships. This theme, however, is analyzed in a context – emerging countries – with very specific features, both from a cultural point of view, given the condition of subordination, marginalization and lack of inclusion of women in emerging countries, both in terms of characteristics of women's enterprises, since they are mainly small and micro enterprises;
4. for all these reasons, results from such analyses cannot be translated tout court to women in business in other countries, characterized by very different conditions about diffusion of new technologies, socio-cultural context and women's role in society;
5. in our literature search no article analyzes the use of social media by women managers or entrepreneurs working in large companies. The only papers we found refer to women entrepreneurs running micro-enterprises. Thus, issues emerging from these papers cannot be transferred to larger companies as in the latter the role of entrepreneur/manager is very different than in micro-firms [27]. In larger companies organization and management are more structured and organizational roles are more formally defined. So personal characteristics of an entrepreneur/manager are less influential on organization and a profound intertwining between personal and professional dimensions of his/her life is more difficult to occur. For this reason we believe that research on the impact of social media should keep micro and small firms separate from medium and large firms.

4 Implications for future research and conclusions

The literature review presented above shows that so far studies on "women and social media" have been carried out focusing particularly on the relationships involving women *in family life, in social life, in professional life and in private life.*

This emphasis on women's networking is in line with studies showing the importance of both formal and informal relationships for female firms' survival and growth [28][29]. Indeed several studies show that networking is a strategic capability for female firms. Moreover, research shows that female entrepreneurs show a more developed ability to networking than male entrepreneurs [30]. The latter, only in

recent times, have discovered the value of relationships as strategic tools for company-run [31][32][33][34]. In light of this, it is very important to analyze the role that social media can have by acting as amplifiers of formal and informal networks developed by women entrepreneurs.

Based on these considerations, we propose a future research project, focused on the use of social media by Italian female entrepreneurs that run small businesses. Borrowing from the CAOS model proposed by Paoloni [35] to analyze the relationship capital of women's businesses, our aim is to provide an interpretive framework to investigate whether and how the use of social media enables female entrepreneurs to increase their business competition as well as to improve their quality of life. To this end, the following variables are relevant to sketch the analyzed phenomenon:

1. personal characteristics of female entrepreneurs;
2. enterprise environment;
3. organizational and managerial aspects;
4. business time horizon.

These factors have been analyzed, in different research on women entrepreneurship to highlight distinctive features of female enterprises [36][37][38][39]. Moreover, each of these factors influences and is influenced by the relational capabilities of the entrepreneur, as it is briefly examined in the following. Personal characteristics outline what distinguishes one entrepreneur from another. These factors affect the role played by female entrepreneurs within their firms and their capability to build networks and take advantage from them. As our research focuses on virtual relationships, the attitude of female entrepreneurs toward the use of new technologies and social media is of some relevance. Enterprise's environment summarizes the socio-economic-cultural context in which the enterprise is located. This context is able to influence all the links that a company can create to interact with subjects in this context and among them. The enterprise environment also impacts on the relationships that can be built using the social media tools. Organizational and managerial aspects highlight women entrepreneur’s objectives, tasks and responsibilities within the organization; with reference to social media this variable aims to understand why and how women entrepreneurs use social media within the company and which are expected benefits. Business time horizon refers to entrepreneur ability to maintain, build and innovate relationships to manage his/her company in the short term and to ensure its survival in the medium-long run. As referred to social media, it refers to entrepreneur’s vision to use social network both for strategic and for tactical purposes.

In conclusion, this study highlights the importance of using social media in women enterprises, as tools that allow women to enhance their networking skills. We also observed that in particular contexts examined by the extant literature - such as in emerging countries - the use of social media impacts positively on private, family, social and professional women’s life. Our research project aims to extend the analysis of the use of social media by micro and small-sized women enterprises in Italy. This project could allow to gain a greater understanding of a relevant subject for all those, scholars or politicians, who are involved in promoting women's entrepreneurship.

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Digital Do-It Yourself in work and organizations: Personal and environmental characteristics

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Abstract. The Makers phenomenon is at the center of both academic and practitioners' studies. Makers are defined as an emerging community of self-described DIY-enthusiasts, tinkerers and hobbyists. With Digital Do-It-Yourself (DiDIY) we mean a new phenomenon that largely overlaps and extends the concept of "Making". DiDIY is based on two main factors. One is the widespread availability of devices (including, but not limited to, 3D printers) that make production of both physical and immaterial "entities" much easier and cheaper than it was even a few years ago. The other is the growing accessibility, often through open online communities, of the related knowledge, designs and other data. We aim at providing both a characterization of Makers and DiDIY-ers operating in the business context of a manufacturing firm. To do so we, first, presents Makers' relevant attributes and then we draw on potential attributes pertaining to DiDIY-ers acting within a traditional (i.e. SMEs or Multinational) organizational setting. We present expected outcomes and we draw research directions for future works.

Keywords: Do-It-Yourself; Digital Do-It-Yourself; Digital technologies; Skills

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1 Introduction

The fundamentals of management and organizational science have been developed and consolidated in an era structurally different from today. Economy was mainly based on goods (atoms) and not on services (bits), economic transactions mainly occurred at the local and not international level (no globalization), the so-called first world experienced a constant economic growth. In that era, technology used to provide tools supporting materials handling (atoms) and not information management (bits). From a demographical point of view, this era was characterized by a far shorter life expectancy and a lower average age of the employed population. The managerial models developed in such a context leveraged on an analytical approach, synthesized,

almost ideologically, in the Taylor's model of work emphasizing specialization and a representation of organizations as deterministic machines. Despite criticism about specific aspects (Yetton 1992; Sharp 1996; Merchant 2012), or the way they have been taught (Spender, 2011), the dominant models taught as fundamentals in business schools are still the managerial classics of two decades ago, such as Ackoff's, Mintzberg's and Porter's models which are rooted, more or less explicitly, in the assumptions listed above. It is at least questionable that these fundamentals, originally designed as conceptual tools to improve organizations and society, constitute as a whole a model appropriate to represent the current state of work and organizations. It becomes crucial to project future scenarios based on disruptive phenomena like the emerging "Digital Do-It-Yourself" (DiDIY) phenomenon. We assume that DiDIY is characterized by an infrastructural and social nature, and it is necessary to explore its impact beyond the changes of the skills of individuals, but also on work and organizations across the industries.

In this paper we aim at providing a characterization of both Makers and a kind of workers (we call them DiDIY-ers) operating in the business context of a manufacturing company. As a first step we transpose Makers' characteristics into a business setting; as a second step we investigate whether these characteristics favor a positive result and in which cases digital technologies can be used to favor DiDIY-ers (e.g. people empowerment) or – on the contrary – they are used only to automate workers' tasks.

2 Background

2.1. Do-It-Yourself (DIY)

Do-It-Yourself (DIY) is a well-established and broadly studied phenomenon, leveraging on the relationship between production and consumption, reshaped by amateurs committed to self-production. Recent literature defines DIY as related to "both a producing and consuming culture" (Edwards, 2006). The Makers phenomenon shares similar roots with DIY. Makers evolved from the will to "make" at the individual level, into sharing knowledge and cooperating within organizations, following different business models.

During the 80's, computer hobbyists formed communities to create, explore and exploit software systems, resulting in the Hacker culture. Over the past few decades, digital tools such as social networking platforms, online sharing platforms, and other online collaboration technologies facilitated a renewed interest and wider adoption of DIY cultures and practices through easy access to and affordability of tools and the emergence of new sharing mechanisms. Recent breakthroughs in technology afford sharing in a way that anyone can quickly document and display their DIY projects to a large audience (Hoftijzer 2009; Kuznetsov et al., 2010). An emerging body of tools allows enthusiasts to collaboratively brainstorm and troubleshoot their work, often in real-time (Franke et al. 2006). This wider accessibility of information is attracting individuals who are curious, passionate and/or heavily involved in DIY work. Thousands of DIY communities exist today, varying in size, organization and project

structure (Leadbeater, 2008). Some allow members to contribute asynchronously on a variety of topics, while others focus on specific projects, some revolve around smaller in-person gatherings, some enable hobbyists to trade or sell their projects, and decentralization has enabled large communities to form around the transfer of DIY. Conventions and Maker Faires also provide opportunities to meet other Makers, show off projects, and exchange information on ways of making.

The entity of the Makers phenomenon led to an increasing interest both from the academy and practitioners (Anderson, 2012; Buxmann et al., 2013), but still several research gaps remains. One of the open issues is identifying the skills characterizing a maker, and which - among those skills - can enable her to achieve superior performances. To this aim, the available research results about DIY provide only a limited support. Besides the DIY-related skills, implicated by the manipulation of physical objects, it is necessary to consider the specific competences related to the use of hardware and software tools and the characteristics of the environment in which such competences are developed, applied, shared.

2.2. Digital Do-It-Yourself (DiDIY)

The DiDIY phenomenon, ie the DIY enabled by digital technologies, among all its impacts and changes brought at both societal and organizational levels, is reshaping work and organizations due to the interactions between DiDIY-ers (and their aggregations) and their environment (Grover et al., 2012). The spread of a DiDIY mindset and DiDIY activities among individuals, acts as a strength influencing the evolution of the socio/economic/technological environments, together with other global phenomena, such as technological progress, globalization, migration (McKinsey, 2015). By exploiting these trends, i.e. digital technologies and knowledge sharing within certain communities, activities previously carried out by experts are now carried out by individuals (the DiDIY-ers) and this shift leads to ask for a reshaping of certain organizational roles (or, at a higher level of aggregation: certain organizational units, certain enterprises), workplace processes and structures.

To understand which skills characterize DiDIY-ers, we believe it is necessary to draw insights from the Maker phenomenon, to exploit the fundamental elements it shares with DiDIY. One of them is participation in a community, which is driven by values (Dewey, 1929), beliefs (Elby et al., 2001), and dispositions (Perkins et al., 2000). These drivers help shaping the Maker mindset: playful, asset- and growth-oriented, failure positive, and collaborative (Martin, 2015; Peppler, 2013). As investigated by Dougherty (2013), it is “experimental play” that have fostered the rise of new digital tools, an easier access to components and growth of online communities eventually culminated with the explosion of the Maker Movement (Martin, 2015). Playful activities along with fun are at the hearth of the activities of the Makers, who work together for “their pleasure in making and using their own inventions’’ (Gershenfeld, 2005).

Persistence in the challenge of making (Vansteenkiste et al., 2004) and environmental conditions - such as a playful learning environment - encourage experimentation and create the basic conditions for the development of conceptual

knowledge and adaptive expertise (Hatano et al., 1986). Another important element emerging from seminal papers is the freeness of Makers to focus on doing the task or job they want. They can strengthen their expertise background while focusing on something new to learn. One of the Makers' qualifying traits is their focus on skills rather than on abilities. As reported by Martin (2015), "making advocates a growth mindset, where, given effort and resources, anyone can learn the skills needed to complete any project they can imagine".

Learning environments that advocate a growth mindset encourage persistence, challenge seeking, and learning (Dweck, 2000). Making environments typically give youth substantial say in what and how they make. Learning environments that support youth autonomy and control of their endeavors are more motivating, support engagement and persistence, identity development, and the growth of resourcefulness" (Azevedo, 2011; Ryan et al., 2000). What is remarkable within the Makers community is that free-choice nature of making, emphasize assets and the ability to learn over deficits—an orientation sometimes missing in school settings (Gutierrez et al., 2003). Therefore, Makers do not experience failures of making as demoralizing (Soep, 2014) but they understand that overcoming small obstacles is equally important. Petrich et al. (2013) state that "the process of becoming stuck and then unstuck is the heart of tinkering", and they find that such moments are often among the most salient in participants' post-activity interviews. Sharing ideas, project, helping others, making and connecting characterize Makers under the collaboration perspective. This mindset is probably the most important element when talking about Makers and is shown both in online and in offline communities where Makers group and collaborate to show their work (Kuznetsov et al., 2010).

2.3. DiDIY within Information Systems

A recent stream of research arising within the Information System domain deals with new business roles reshaped by the rise of new DIY technologies. The impact is at the employability level, given that some roles need "a long education to develop new skills" (Davenport et al., 2015). Bernstein and Raman (2015) reported that "technological progress has decreased the demand for low-skilled information workers and increased it for highly skilled ones". The opportunity to have optimization of operations, ease of design and flexibility in reconfiguring ecosystems is boosting the rise of digital manufacturing (D'Aveni, 2015). A so-called "digital tsunami" is generated by new computing capabilities and rise in digital data generation thanks to the diffusion of disruptive technologies such as additive manufacturing, autonomous robots, data analytics tools and industrial Internet of Things (IoT). "Digital technologies are transforming manufacturing value chain, from research and development, supply chain, and factory operations to marketing, sales, and service" (McKinsey, 2015). Eventually, the large-scale availability of fast and pervasive internet connection is transforming the information flow inside and outside firm boundaries.

Manufacturers are opening up to the opportunities and threats of a digitization phenomenon brought by the above digital transformation: as an example the rise of

big data analytics, together with large storage capacity, is driving new insights on manufacturing data. Another example is coming from additive manufacturing where blurred boundaries between building and productions of products are setting the competition on designing better products customized on customers' needs. Together with design, is the production that is facing one of the biggest disruptive changes: manufacturers will perform better if close to the customers and therefore, more feasible and localized. At the strategic level of an organization, decisions will be tightly coupled with operational ones as long as there will be a need for real-time decisions (D'Aveni, 2013).

3D printing, and the digital tools that support it, plays a key role in this changing scenario (Koten, 2013). 3D printing has been used for several years with the aim to rapidly prototype new components (Gibson et al., 2010) but the way it is used nowadays is different. Due to the birth of low-cost 3D printers and the expiration of several patents, 3D printing has opened the path to innovation. "Bursts of innovation happen when an emerging technology removes a once prohibitive barrier of cost, distance, or time" (Lipson et al., 2013). Gibson et al. (2010), studied the combination of digital technologies and entrepreneurship thus coining the term *digiproneurship* to describe the phenomenon of where people are "returning to the garage and making things that satisfy the needs of one or a very few customers".

At the same time, recent developments in digital fabrication have opened avenues for creating artefacts with embedded digital information in an easier way (Maye, 2013). Additive Manufacturing, paired with Internet of Things, may provide far more opportunities in creating positive network externalities. They show complementarities more frequently than physical assets because the potential joint value of a combination of two digitized assets often exceeds the sum of the parts of their value in isolation (Tiwana, 2014).

Summarizing all the relevant changes presented, we can say that digital technologies are helping manufacturing firms to connect physical assets altogether, unleashing a flow of data between different organizational units. Data digitally generated at production level can be accessible throughout the overall organization, thanks to a shared and cloud-based infrastructure. Sensors, distributed inside manufacturing lines, collect data from the field and populate online database where these "big data" are analyzed in real-time to take corrective actions. Lastly, managers and workers face a steady introduction of digital (hardware and software) technologies in their daily activities, that puts them in a condition to digitally advance their skills.

Thus, a research question, and the related sub-question, arises:

- How will the work of a worker in a manufacturing firm be reshaped due to the influence of DiDIY (Morris et al., 2010)?
  - How will the work of a worker in a manufacturing firm change in relation with the evolution of other organizational roles in her firm (Zhang et al., 2013)?

3 Research design

Previous sections of the paper aimed at highlighting which are the relevant elements that characterize a Maker in terms of her skills, activities, technologies and knowledge sharing mechanisms. We assume that by transposing such elements into the organizational setting of a manufacturing firm we can shed light about the research questions mentioned above.

An important difference between Makers' aggregations and DiDIY-ers working in a firm is that Makers are free to act independently on organizational norms that, on the opposite, regulate a traditional organizational setting. Moreover, any organization has specific mechanism of incentives and rewards for its workers and this can drive their motivation to perform better. Eventually, we believe that Makers connects on a voluntary basis and are driven by grassroots passion to build and innovate using digital technologies. On the opposite, DiDIY-ers in organization are using digital technologies, introduced by the top management as an outcome of an overall firm strategy, to perform better (performance can be evaluated among different dimension that encompass financial, operational and organizational improvements).

Despite these differences, Makers and DiDIY-ers show several similarities that can be highlighted using a framework articulated in two dimensions: personal characteristics and environment characteristics. The framework is derived by the studies conduct on Makers (for the personal characteristics) and Maker spaces (for the environmental ones): such characteristics are translated, transposed to manufacturing workers, to fit the different organizational setting in which they operate. The framework aims at empirically investigating the characterizing traits of a DiDIY-er in an organization, and thus at defining who a DiDIY-er is.

To do so, we presents Makers' relevant characteristics. For each of them, we first infer a potential attribute of a DiDIY-er, and then we propose a question that should be used in an empirical investigation to detect such attribute for the workers in a manufacturing firm.

3.1. Personal characteristics

- Job attitude: Workers usually have a production plan to follow and do not focus on the job they want. On the other hand, Makers are free to focus on the task or job they want. This calls for a growth mindset, where, given effort and resources, anyone can learn the skills needed to complete any project they can imagine. In this light, digital technologies impact on the job allocation by granting a certain degree of flexibility (i.e. anticipation or delay of specific tasks) that can empower workers in prioritizing jobs according to their job saturation. The question to be addressed with the empirical investigation is "how personal attitudes and motivations can be fostered in the working environment building on the case/experience of the makers generating innovation?" (Martin, 2015);
- Autonomy: Within organizational settings this does not usually happen given that most of the workers respond to a specific and fixed organizational structure. Making environments, instead, typically are characterized by autonomy and

control of endeavors that creates more motivation, support engagement and persistence, identity development, and growth of resourcefulness. We believe that digital technologies will allow coordinators of specific functional areas to be flexible in their activities and prioritize or postpone specific tasks (i.e. taking strategic decisions although being operative people). The question to be addressed with the empirical investigation is "in which context or tasks the availability of higher levels of autonomy may increase employees' commitment, creativity and innovation?" (Martin, 2015);

- Failure positive: It is not traditionally perceived positively in most of the work settings. Workers in traditional organizations that fail to compute a task may have negative feedbacks from their superiors. Yet, within the maker mindset, failure is celebrated. In Making circles, failure is seen as a productive possibility to better understand the structures and constraints of problems, so that they can learn better and try again. We believe that this mindset can enable the identification of improvements in business processes (i.e. operative people learn better or faster methods to accomplish a task). The question to be addressed with the empirical investigation is "how the process of facing and adapting to multiple sticking points may be important to the development of adaptive expertise?" (Martin, 2015);
- Multidisciplinary: In traditional organizations workers have a task and they have to complete it more efficiently as possible (they traditionally have a specialization). The Maker Movement welcomes all types of making. Typical interests enjoyed by the Maker culture include engineering-oriented pursuits such as electronics, robotics, 3-D printing, and the use of CNC tools, as well as more traditional activities such as metalworking, woodworking, and, mainly, its predecessor, the traditional arts and crafts. We believe that this characteristic could be beneficial in the organization in terms of motivation and new skills gained through interaction among others. The question to be addressed with the empirical investigation is "how the collaboration between experts in a task and other workers is needed to help build bridges between the tacit knowledge cultivated through the act of doing and the explicit and abstracted formalisms valued in assessment?" (Peppler, 2013);
- Playfulness: Workers in traditional organization are characterized by an attitude of seriousness. Instead, the act of making is a playful one as Makers are pushed to make by passion to discovery in a learning by doing way. Indeed, they are characterized by a critical engagement with technology often characterized by a sense of play around technological norms. We believe that this characteristic could bring new motivations for workers in organizations. The question to be addressed with the empirical investigation is "how playfulness can be fostered within traditional organizational settings?" (Tanenbaum, 2013);
- Anti-consumerism behavior: Traditionally in organization there is low environmental awareness and this is translated in waste of materials, energy and money lastly. Makers, instead, are reported to support sustainability through an ethos of fixing and remaking. 3D printing and other technologies enable people to create the spare parts which will make something work again, or to develop innovative solutions to make things usable in new ways. These practices could be effective also in organizational context both with or without digital technologies.

The question to be addressed with the empirical investigation is "how a behavior that pays attention to sustainability can be fostered in the working environment building on the experience of the Makers' serendipitous bricolage?" (Tanenbaum, 2013);

- Computational thinking: While in traditional organization when workers face a problem in complete a task they have to inform the supervisor that will handle it personally, instead Makers use computational thinking to overcome difficulties. Computational thinking aims at training train people to think like computer scientists when facing a problem. This practice could be effective also in organizational contexts to spread problem solving and independence in the production line. The questions to be addressed with the empirical investigation are "how the introduction of computational thinking could be efficient in a production line environment? Which computational tool could be helpful in doing this?" (Wing 2010; Rode 2015).

3.2. Environmental characteristics

Quality and availability of tools: one of the most apparent features of the Maker Movement is the celebration and use of new and affordable digital tools. As these tools provide new ways of interacting with physical materials, they also offer new opportunities for learning so they are seen as enabler for the movement. Tools, like 3D printers or CNC mills, are all based on the same principle, using software to help guide the movements of a machine tool. These could have a huge impact in organizations and lead to a new industrial revolution. The question to be addressed with the empirical investigation is "how these tools can improve productivity and pleasure to work of workers within the paradigm of Industry 4.0?" (Anderson 2012; Martin 2015);

Connected facilities: Makers, rather than just be isolated, are stitched together in the larger Maker Movement through several events (like Maker Faires hosted locally, nationally, and internationally), periodical subscriptions like Make magazine, online communities like instructables.com or DIY.org, while maker adherents can connect through non-profit organizations like Maker Education. In this way knowledge is shared online and through social networks. The question to be addressed with the empirical investigation is "how translating this characteristic (providing an online community within organization's facilities) in an organizational context could improve communication and productivity at plant levels?" (Peppler, 2013);

Gamification: Maker Movement leverages on online communities that extend offline collaboration and provide spaces of collaboration and knowledge sharing. User participation in an online innovation community seems to be fostered by game elements that relate to the gamification concept. Gamification in an organizational context could be a disruptive innovation, leading sharing platforms to take place, with the aim to motivate people through the use of game elements and dynamics in nongame contexts. Game design elements refer to game design principles, game mechanics and game dynamics, storytelling and other aspects typically incorporated into games. The question to be addressed with the empirical investigation is "how

gamification mechanisms, if adopted, can improve the knowledge sharing, motivation and participation in an organization's online community?" (Hofferbert, 2015);
Openness: Closeness represents a typical trait of workers' behavior. Vice versa, sharing ideas, projects, helping others, making and connecting, characterize Makers under the collaboration perspective. The presence of digital technologies enabling information sharing may generate a higher degree of openness. The question to be addressed with the empirical investigation is "when is it possible to introduce higher levels of openness and collaboration in the working environment to foster team building and innovation?" (Martin, 2015)

4 Methodology

A qualitative methodology, as reported in literature (Dubé et al., 2003), aims at providing valuable insights into proposed interaction between constructs. A team of researchers will collect all the data and analyze them: this approach will be helpful in capturing greater findings and maximizing reliability. Following Yin (2003) a case-study protocol will be designed including the following sections: overview of the project (objectives and issues), field procedures, questions, and guidance for the report. With respect to the current study, two criteria will drive the choice of a case study research: the cost per subject and the potential for theory generation. In the empirical section of this research we use an exploratory case study whose aim is let the emergence of changes in people and firms performances induced by technologies. A multiple-case study approach (Yin 2003) will be chosen for investigating the theoretical framework on how DiDIY is reshaping the work of a worker in a manufacturing firm. The approach will be appropriate in order to answer to our research questions on which are the phenomena characterizing the reshaping of the work of a worker (Benbasat et al., 1987; Yin 2003). Future research will be, wherever possible, in the direction of a longitudinal study to facilitate comparisons and draw better insights.

The unit of analysis chosen will be a worker in a manufacturing firm. The case unit will be analyzed through the collection of primary and secondary data. Primary data sources are interviews, direct observation, and informal discussions. Secondary data sources will mainly be a set of documents of the firm that are produced as a consequence of the DiDIY transformation. Before starting the collection of primary data (Darke et al., 1998), some preliminary background information will be collected in order to help the interviewer during the data collection process. The preliminary information will come from the Internet web site of the firm and some supplementary information will be given by the organizational interviewee. Together with a representative of each firm, the names and the positions of all the potential participants will be identified and contacted for an interview (Darke et al., 1998). The interviews will be semi-structured interviews (Kerlinger 1964; Emory 1980). In order to operationalize the theoretical constructs and ground the findings, whenever possible, will be interviewed key representatives of a "worker". The interview will be focused on introducing the main themes and sub-themes to discuss together with the

interviewee. At the beginning of each interview an introduction on the reasons and the objects of the interview will be performed (Miles et al., 1994). This explanation will reduce the researcher effects at the site, which could bias the data collection (Darke et al., 1998; Miles et al., 1994). The interview guide will be designed to gather the characteristics of the interviewee and what is her/his view.

The set of data produced by each interview will be analyzed in parallel with the prosecution of the other interviews in order to use the content of the previous interviews as source of questions to ask in the next interviews (Miles & Huberman 1994).

To increase homogeneity and comparability between the firms, a selection of them will be made according to specific criteria such as B2B or B2C situation and similarity of firm size. Cases will be chosen for enabling theoretical and literal replications (Yin, 2003). In order to ensure theoretical replication, at least two firms will be selected.

5 Expected results and future works

It is under investigation the impact of digital technologies (DiDIY-related) on the activities carried out by a worker in such a way that his/her role will be critically reshaped. The focus is on analyzing how Makers' characteristics, both individual and environmental, can generate an improvement – or, elsewhere, points of attention, in an organizational setting. We believe that, together with activities, competences will be reshaped accordingly. For example, a worker will need not only operation competences to execute specific tasks on a product but event strategic competences traditionally pertaining to manager. This big shift is resulting from the digital potential that nowadays is impacting on the automation of activities, especially in production (McKinsey, 2015). An example we expect to gather from our data collection will be the following: understanding how the work of a worker (e.g., a supervisor of job activities in a production cell) in production is reshaped by the introduction of recent digital technologies (e.g., IoT, Mobile, Cloud, …) in such a way that instead of simply allocating jobs to workers (following a schedule defined by top managers) he will take strategic decisions on which are the most critical activities to be prioritized. Clearly, this will put him/her in a position to freely allocate – based on decision taken at production level (related to worker's competences, workstation saturation, …) – the job to be carried out. Therefore, this action will carry a set of strategic skills that previously were not part of the skills portfolio pertaining to him/her thus. This flexibility, enabled by both software to support production such as PLM and new hardware to track items and grant visibility such as Radio Frequency Identification (RFId) and sensors, is transforming the traditional production context. Summarizing, according to this technological shift, we aim at investigating the impact, of such opportunity to have big data about production, on the activities carried out by a supervisor of a production process.

The context of the empirical study will be a set of manufacturing firms facing a digital transformation within their internal core processes: digitalization of physical

assets thanks to the introduction of digital technologies (e.g., auto-identification sensors within a production line thus transforming/reshaping how workers interact with the environment). This will affect their traditional activities that will, now, require a more managerial approach and not technical only. The reshape of work activities is considered fundamental and around this topic will be centered the data collection phase.

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Can social media help start-ups to succeed? A critical study of start-up businesses

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Abstract In our current Social Media (SM) driven environment, it has become vital for start-up businesses to get acquainted with social networks in order to support the growth of their business. SM use has arguably become a key factor for nearly all start-ups and young enterprises growth and success [1]. However, some start-ups have chosen not to use SM for their business activities and have managed to grow without it. This is considered particularly strange in the current digital era where SM is considered an obligatory technology to be capitalised. Therefore, an investigation of their perceptions and attitudes towards SM are assessed and their main contributors towards their success are identified. This study explores whether SM can influence start-up businesses and what its significance might be for their business activities. Furthermore, the study investigates what factors make a start-up business successful and how SM can contribute to those start-up activities. A literature review and ten interviews examine how some start-ups in Portsmouth are using SM and what benefits and drawbacks they have experienced. Finally, a summary of whether SM is a prerequisite for start-up success is revealed and what the main contributors to their success are.

1 Introduction

The aim of this study is to evaluate whether Social Media (SM) is a prerequisite for the success of start-up businesses and to examine the hypothesis: "*is it possible for start-up businesses to grow without the use of SM*". In order to accomplish this, the study began with an investigation on how SM is used within businesses in general and attempts to reveal how some start-ups use SM for their business activities. After identifying how SM is being implemented, the study explored the positive and negative effects of SM for start-up activities. Additionally, the study attempted to identify what the success criteria for start-up businesses are, before evaluating whether or not SM contributes to start-up success in the city of Portsmouth. After

these topics have been covered, a conclusion was made on the hypothesis of whether SM can help start-up businesses succeed.

2 Background

Different start-ups have different aims; according to Baum & Silverman [2] some of the objectives that make a start-up successful are the organisational growth or the growth of the number of employees. However, some authors view the number of customers in comparison to the start-ups strongest domestic and international competitor or the revenue dimension as a success indicator [1]. In summary, scholars and academics disagree on the factors that make a start-up successful and there is no unanimous consensus on "*success*". This was mentioned by Chatfield [3, p. 24], *"commonly accepted measures of success for the new ventures are elusive, unfortunately. Murphy, Trailer, and Hill (1996) determined that no one-dimensional measures are often contradictory, leading to unclear results"*. For the scope of this study, the author only focuses on the growth of the organisation and revenue.

Since the popularity growth of SM, some authors feel this is a key reason to utilise this powerful tool. In our current SM driven environment, it is vital for start-up businesses to familiarise themselves with the dominant social networks in order to grow their business. Many start-up businesses fail to come up with a strategy when they begin their SM marketing campaign [4]. Start-ups should aim to come up with a strategy, as SM is a powerful tool that will increase in importance for marketing and branding the newly established businesses. There are strong arguments for exploring potential opportunities of using SM marketing for branding in publishing [5]. Other research indicates that the utilization of SM and social networks have become a vital factor for nearly all young enterprises that have survived and succeeded [1]. SM empowers start-ups to overcome the restrictions of their limited partners and geographic location by linking them with otherwise disconnected groups in a cost-effective way [6].

On the contrary, SM marketing is not about admitting everyone who requests to link with the business and it is not about how many contacts the start-up has, but rather how much value each contact brings to the business [7]. The approach to identifying the impact of SM has on the business is dependent on how it is effectively utilised [8]. Meanwhile it is apparent that entrepreneurs have a social stigma when it comes to business failures. Gnanakumar [9] states that to reduce social stigma of business failures, the business must develop trust within society. *"The customer reliability is no longer a key competitive advantage. Instead, society as a whole trusting the entrepreneur is a competitive advantage for a start-up to reduce the social stigma related to business failures*" [9, 2012, p. 46]. Complementary to this, the social status of entrepreneurs plays a large role in avoiding business failures [10]. Therefore, evidence suggests that the SM status of all start-ups must be strong in order to be successful, additionally business failure is not caused by lack of experience, rather due to lack of supportive attitudes [9]. The same research indicates

that it is hard to identify the benefits of SM for start-ups as they usually have more strategic aims [9].

Then again, many start-ups lack marketing funds and funding in general, which causes a problem when entrepreneurs are faced with the difficult choice between SM and traditional media promotion [11]. The affordability of SM is further elaborated on by Fulgoni [12] who states that SM could be used as a substitute for media spend if the brand is struggling financially. Although this is the case, based on the findings of Harrigan & Miles [13] it can be argued that start-ups will struggle to make a successful marketing impact, this is due to limited resources and expertise. Many organisations use mass media marketing for the same reasons. Further reasons aside from the feasibility aspect, SM does not require advanced technical knowledge and it is easy to implement as opposed to other collaborative technologies [14]. However, SM marketing differs from traditional media such as email communications, online banners, radio and TV commercials, it enables interaction between the client and the consumer directly as well as consumer to consumer. Henceforth, firms over the recent past years have increased investments in SM causing the forecast to $8.22 billion [15].

Nevertheless, there is a lack of research on of start-ups unique and experiential SM practices, which has caused the interest of academics and practitioners. This is because they would like to understand their SM practices as a source of market intelligence for their marketing activities [14]. Ultimately, the value of SM marketing is dependent on how it is implemented [8]. Other authors agree that there is no guarantee on how much of an impact SM will have on each business, organisations in our time cannot risk not engaging in SM while they watch their competitors successfully utilizing these tools [16].

Some start-ups choose not to use SM for their businesses activities. Their limited expertise and financial capabilities could be a reason for this decision. An illustration of this is technologies such as SM are worth very little without a team dedicated to executing their marketing strategy [17].

Based on the findings of O'Leary, Sheehan, & Lentz [18] it can be argued that start-ups tend to not engage in the use of SM. Usually because of the wrong perception they have about the potentials of SM. Start-ups have the view that if they build a SM presence, they will gain a large following on their SM platform. However, this usually works for larger brands that already have a loyal community of users. Start-ups need to work hard to create a dynamic online media presence, to do so; they need to work on building relationships with the participants in the SM space [18].

Consequently, start-ups may feel pressured to use SM because companies of all sizes and types are increasingly using SM to sustain and establish relationships with relevant stakeholders [14]. There is evidence to suggest that start-ups do tend to react quickly to environmental pressures (such as SM) especially those who are in more dynamic industries [14]. Turban, King, & Lee [19] concur that the evolution is driven by the explosive use so SM sites, they further elaborate that customers heavily rely on the social recommendations.

Additionally, social recommendations or word of mouth through SM is an important factor for the growth of a business. This is especially the case for start-ups

because it can help them get close to their customers and potential customers. However, negative online reviews could damage the start-ups reputation and tarnish the image of the business [20].

The main findings from the literature review were as follows: There is no unanimous consensus on what makes a start-up successful. There is a lack of research on start-up's unique and experiential SM practices. However, it is evident that SM is an appropriate tool for start-ups s because they are readily available, mostly free, and easily scalable. SM will reduce expenses because it is a free method to let customers help themselves and each other. SM also gives start-ups the potential to reach a vast number of prospective customers and will help with building brand image, awareness and sales, which can be useful to engage with customers. Furthermore, SM has the potential to provide mutual benefits of value for both the customers and the start-up.

Although SM can help start-ups grow, the most important step of all is understanding that the product or service is the heart and soul of the success of the business [21]. It was noted that SM is only one aspect of marketing and start-ups should be engaging in additional methods to support business activities. There is also evidence to suggest that the most common causes of the negative effects of SM are inadequate measurement systems, low support and involvement of management of the organization and lack of understanding of the business benefits. Limited time and training of start-ups also contribute to the list of the concerns to successfully use SM and to develop strategically. As a result, it has been derived that start-ups should do more to protect themselves from potential legal liabilities and security issues as well.

3 Methodology

An interview practice with a fluid agenda of largely open questions was used as the study aimed to search for any patterns that arise from the subject which may echo or contradict the information gathered from the literature review [22]. McMillan & Weyers [25] argue that a face-to-face interview will be able to capitalise on the participant's body and verbal language to express opinions, experiences and feelings. This helped with transparency between the interviewer and the participant and allowed the answers to be clearly understood in order to identify any trends that can help answer the research questions. Face to face interviews are flexible and are an adaptable way of finding things out, not just orally but facial and body language is a very good enquiry technique [22]. Moreover, the author has control over the line of questioning and can adapt accordingly [23].

The semi structured interview approach is the most popular technique used in qualitative research [24]. The author feels that this enabled flexibility rather than a fixed sequence of dialogue, which allowed the participant to reveal issues or points that were not included in the pre-devised plan [24]. On the other hand, interviews produce biased responses because of the researcher's presence [23]. The interviews can be time consuming as opposed to regular questionnaires; may vary in length depending on the interaction of the participant and the level of detail of the response [22]. Other limitations include that the participants are not equally articulate and their

ability to express themselves may vary which can affect the quality of the data retrieved [23]. In order to mitigate potential problems that may arise, pilot studies were conducted to two businesses. These pilot studies helped filter out what questions best suited the aim of the study and what questions seemed to be repetitive. In order to ensure that the participants are articulate enough to express their feelings, the study focused on interviewing higher management. This also ensured that the people speaking on behalf of the start-ups are confident talking about their business, however, some managers are more articulate than others. To mitigate this problem, after the interviews had concluded, the notes were shown to all the participants and they were given an opportunity to add any extra thoughts or edit their responses. Finally, it then becomes in line with the ethical values of the study that all information gathered would be accurate.

The questions for the interviews mainly consisted of open-ended questions so they will not constrict the responses of the participants [22]. Additional advantages of open-ended questions are that it allows a detailed range of answers in order to gather each employee's perspective of how much of an impact SM has on their business success. Cohen & Manion [24] express more advantages to open ended questions as it allows the interviewer to probe the participant to go into more depth on a particular point or to clear any misunderstandings. This helped the researcher ensure the integrity of the information gathered and assisted in clearing any misunderstandings during the interview phase.

It can be difficult to filter out what questions are relevant to the research objectives [25]. Robson [22] suggests that another disadvantage to conducting interviews is the possibility for the interviewer to lose control of the structure. Further challenges include the analysis of the gathered data as it can become more difficult than closed questions. In order to keep the questions within the scope of the study, the questions were organized into three categories (About your business, About you, Social media use in your business).

The first category ‘about your business’ gives an opportunity for the participant to list which business sector it is in. The range of business sectors was taken from the national statistical institute for the UK [26]. After this was established, an enquiry on the size of the current state of the business since it began and how long the start-up has been running. This gave a brief overview with what kind of start-up the research is handling and to see if there are any familiar patterns with correlation between business sector and effective SM use. Some of the questions for the interview are related to the research aims however, some are there just to help the interviewer put the participant into perspective.

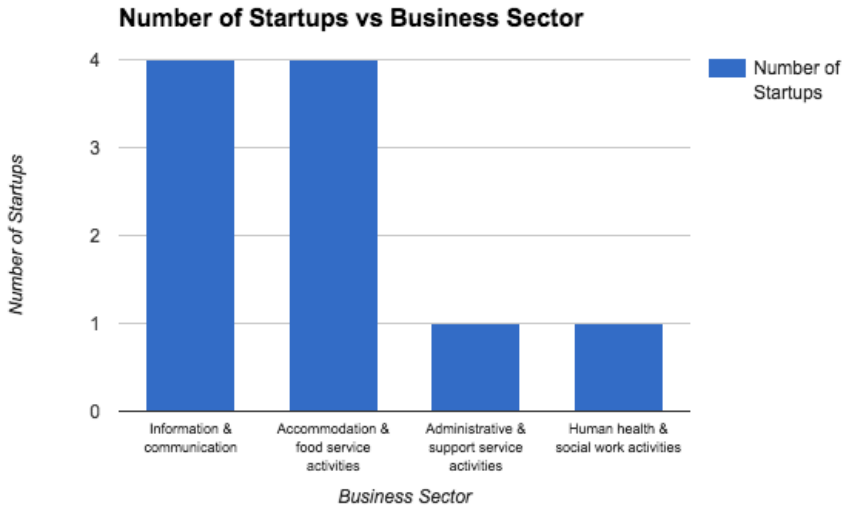
After the start-up had been defined, the second category ‘about you’ enables the participant to list what job role they hold and what previous experience they have with SM. This has put the participant in context, in order to assess what kind of employee is submitting the information on behalf of the selected start-up. Additionally, the start-ups were given a chance to elaborate if they have had any previous experience with SM as this can affect the reliability of results depending on what current SM awareness they have.

The third category 'Social media use in your business' investigates if the start-up business uses SM as a tool for business and if so, it allows the participant to go into specifics of how SM is used to gain a competitive advantage and which platform's it uses specifically. If the start-up does not, it gives the participant an opportunity to express why their business does not use SM as a tool for business use. It further requests for the participant to select which SM platform the start-up uses and requests to give a rough estimate of how many followers/likes the most successful platform has. This then facilitated the analysis phase to see if there is a similar pattern on what platforms the start-ups use and how much followers it has in order to identify if there is any significant engagement that could facilitate the success of a start-up.

4 Results Analysis

From the 10 start-up businesses interviewed, all of them fell under the 'small' business size category. Half of which stated that they do not use SM for business activities. The other half stated that they did, however, the aims and purposes for their SM use varied. As discussed previously, the research enquired on the position of the employee within the start-up to ensure they have the capacity to discuss the business status. All of the participants who took part in the interviews were in a position of higher management and leadership. Nine of the interviewees were Owner/Partner/Managers and only one of them was an Assistant Manager. Figure 1 shows the number of start-ups interviewed and the different business sectors to which they belong. The study focused on start-up businesses in Portsmouth that have been operating for less than five years. However, the study interviewed start-ups that have been running from a range of operation periods in order to identify if there was any correlation with SM use with brand new start-ups and start-ups that have been running for a longer period of time. Figure 2 shows the diversity of operation periods. What follows are example findings highlighting themes relevant aspects. An initial question was -Do you use social media for your business? If not, why?

- *"I don't see the need of it because I use classical approaches to marketing my business, such as business cards, leaflets and word of mouth."*
- *"I don't need to use it, I'm using a different method. I mainly rely on word of mouth and business card/leaflet distribution."*
- *"My business is fairly small and I do not want to waste money advertising through social media, there is simply no need, my business is local if people need my services they know where to find it."*
- *"Firstly, it is a very small business and it is very locally based. The customers are all local, and it doesn't need to be advertised, as it is a local retails store. Also it is not something niche or extraordinary that needs advertising attention, everybody is aware that my type of business exists. There are similar businesses to mine in the surrounding area."*
- *"We have a low budget for paid advertising, Facebook I have a low number of friends so I will not get a large target audience. I also lack the technical skill to use SM."*



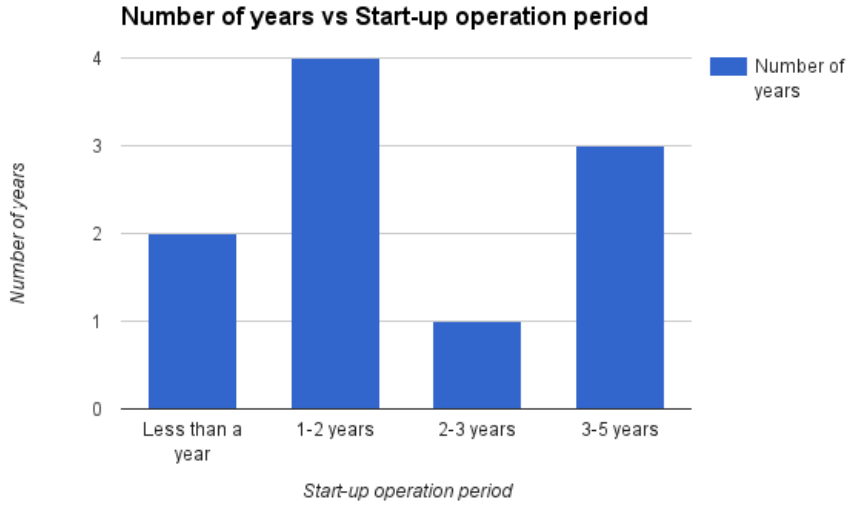


Fig. 2. Number of Start-ups

Fig. 1. Number of year's vs Start-up operation period

A consistent theme that occurred when the start-ups described why they do not use SM for their business was the lack of 'need'. Four of the start-ups stated that they

struggled to see the need to use SM for their business activities. The most common reasons for the lack of need is the participants see their start-ups as a small business and they do not want to invest into SM due to lack of funds. In addition, they tend to refer to traditional practices such as using business cards and word of mouth. Many of them seem to hold the perception that SM use for business requires an investment and are not aware that there are free methods to capitalize on the technology. This implied that the higher management of the start-ups lacked sufficient knowledge of SM use for business and its potentials. Consequently, the researcher asked – "If not, what do you know about SM and its potential impact for business use?"

- *"Negative reviews can damage my business reputation and image of my image, as there is no way to moderate or filter through which reviews are given about my business. However, if my business was bigger, it could help marketing and promoting our products and service."*
- *"Maybe it could be effective, but for my company it is not necessary because I am a small company and I am self-employed. I think for large companies it is more of an obligation for them."*
- *"I have heard that FB can help but it's not down to the number of likes it is down to the engagement on the SM platform. The most beneficial aspect would probably be SEO."*

There seemed to be a variety of responses for this question. However, the main theme gathered in the results was a lack of knowledge about SM. Four of the respondents seemed to have very little knowledge about SM and they only focused on one aspect of it, such as advertising, promotion and reviews. Based on their responses, there is little evidence to suggest that they have deeply investigated the potential for SM for start-up activities. One of them, however, seemed more aware and expressed that SM is dependent on the engagement of customers on the SM platform and he considered Search engine optimization (SEO) to help with start-up activities. Even so, he stated that he heard this from a colleague, rather than doing his own investigation on the matter. A recurring theme from the previous question became apparent when the respondents felt that due to the small size of their businesses, they do not need to engage in SM. All the respondents expressed this notion, it appeared that the start-ups viewed SM as something large businesses use and they did not see themselves worthy of using it. This became clearer when the researcher asked the next question. "Would you ever consider using social media to support your business, why?"

- *"If my business grew, it will be an easy, cheap way to grow my business and reach a large audience."*
- *"If my business turned into a franchise and expanded, I would see it to be necessary or beneficial."*

When asked if SM was something they would consider in the future, three of the start-ups said they would not, this was for the same reasons why they do not use SM currently. The other two start-ups were open to the idea, however under a certain condition. They both stated that they would only use SM if their business grew, expanded or became a franchise. These responses complement the earlier notion where start-ups do not see the value of SM for small businesses. The start-ups stated they would only use SM when they expand, however it can be argued that they would

find it difficult to expand without using SM as a tool for growth. Now that the perceptions had been gathered by the researcher from the start-ups who have been growing without the use of SM, it was time to identify what start-ups who do use SM say when asked the following question. – "How did you use SM in start-up activities? Which of the social media platforms do you use and why?" (Fig 3)

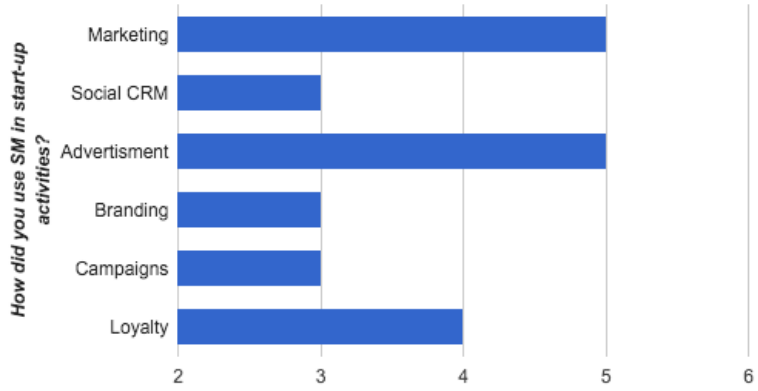


Fig. 3. How did you use SM in start-up activities?

From the start-ups that engage in SM, the most popular SM platform identified from the results was Facebook and Twitter (see Figure 4). The most popular start-up activities the start-ups engaged in with the help of SM was Marketing and Advertising (see Figure 3). Further examples of how effective SM was for these activities were elaborated in the next question. –"Do you have any examples? How successful was it?"

- *"WhatsApp and Facebook have been a success for my business so far in terms of sales and advertisements. When customers leave good comments and likes for us on Facebook regarding our services it brings us a lot of new customers."*
- *"If you have special offers or new products it is a good way of letting customers know, also you can reach new customers from a bigger radius."*
- *"We have published laptops on SM on Facebook and we have sold a few products with the result of SM advertisement."*

The most common themes for the advantages of SM were the potential to reach a larger target audience and a generation of new customers. Moreover, the participants stated that SM is a good mechanism to promote offers and promotions, which fall under the advertisement category. Findings from these results also complement some of the points made earlier about start-ups lacking sufficient knowledge of SM capabilities. They only seem to use SM on basic advertising and marketing but do not use SM to engage in any further activities. This became clearer when one of the participants stated: "*Initially I had no experience with social media…*". One of the

start-ups mentioned another point on the potential for customers to leave positive reviews and feedback. They mentioned how it can help develop the start-up image and can attract more customers based on positive testimonies. It is also important to highlight any drawbacks experienced when using SM and the potential reasons for them.

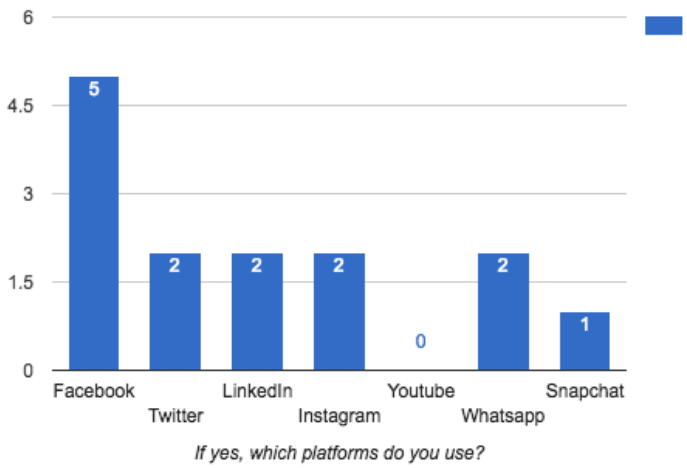


Fig. 4. What SM platform do you use for start-up activities?

A further question was – "Have you had any drawbacks with social media use for your business, why do you think that is?"

- *"We receive negative feedback on SM when a customer is not happy with a product or service."*
- *"It is difficult to maintain as we have very limited staff with experience."*
- *"Keeping the page up to date and stuff seems difficult."*
- *"Yes at times. This was due to some bad management decisions early on in our marketing days of the business which we learnt from."*

The results identified that start-ups struggle to manage and maintain their SM presence. Three out of the five start-ups who do use SM said that they are finding it difficult to commit the time or employees to the task. One of them stated that they struggled to come up with the correct management decision and made some mistakes, from which they learnt. This indicates that they did not have a clear vision of how they wanted to implement SM within their start-up activities. Thus, further elaborating on the point made earlier regarding the lack of sufficient knowledge of effective SM use.

Although positive reviews have its benefits for the start-up, it can also have a damaging effect as stated by one of the start-ups. One participant expressed the concern; that customers have posted negative reviews. This can cause the opposite effect stated previously, especially if the start-ups do not have the technical

knowledge to review and filter out reviews. This can damage the start-ups image as easily as it can enhance it. Next, the researcher asked the start-ups for their opinion on whether they would have grown without the use of SM.

Question: Do you think your business would be as a successful as it is now without social media and why?

- *"For marketing no, but as a whole it wouldn't affect it as much because the target audience are mainly locals who walk by the store and friends through word of mouth."*
- *"No, not really, I have people who recommend and I have people who know me in the area."*
- *"Not after using it for the last 6 months I find it very useful and a FREE option to advertise."*
- *"No because most of the new customers and business we get wouldn't have been possible without the good comments, likes and sharing that we get from our new and returning customers."*

All start-ups that use SM unanimously agreed that they would not have achieved their current growth and success without the use of SM. They all see the benefits of using SM but they all see different benefits. Some see the financial benefits; some see the marketing aspect as a vital asset. Although all of the start-ups viewed SM as a factor of their success, other aspects have helped. These include; local customers are familiar with the start-up owner, other reasons include that their main audience are local citizens who walk by the store. Consequently, that did not require a SM presence so this could suggest that although SM does help, other factors must be present in order to support start-up growth. It is also clear that SM had a significant role in the development on the current progress of some of the start-up. Those start-ups who do not use SM do not appear to grow as quickly as those who do implement it effectively.

The upcoming findings are also enlightening:

Question: Do you think it is possible to run a successful business without the use of social media and why?

- *"I believe you can however it depends on the business model and what product or service you are offering, however with the use of SM you can deliver a more effective and profitable business."*
- *"It is possible of course, as you can use other methods to advertise and market your business (for example yellow pages) and word of mouth."*
- *"Yes, you definitely can, my business is a perfect example of that and of course SM can help however it is not an essential aspect for your business. You can have a million likes on your SM page but they could not be coming into your store to make you more money."*
- *"Yes it is, because my business is small I only have to promote with the use of leaflets or word of mouth and as my business is local and I have no intention of expanding outside Portsmouth there will be no reason to use social media."*
- *"Yes, there are better methods for promotion of your business such as engaging with the public face to face, to build a trust relationship with the consumer."*

All five of the start-ups who do not use SM felt very strongly that it is possible to run a business without the help of SM. They did not think it was a prerequisite for a business success. The prominent reasons for their responses include the following themes.

There are many other methods of promoting a business such as word of mouth and leafleting. Other themes included that business growth depends on the business model and the service the start-up provides. This complements a point made by one the start-ups when they said that even if you have a high number of potential customers on a SM platform, it does not mean that they would generate income for your company.

A frequent theme identified within the responses, one start-up stated that it was a small business and it is not planning to grow further than the city of Portsmouth, so there is no need to use SM. Although the majority of responses state that it is possible to run a start-up without SM, they still acknowledge that SM can help. They just do not see it as a necessity.

The start-ups that do use SM had some interesting comments regarding the same question:

- *"Yes for a start-up, but if you want to expand and go global, you will have to be a fool not to engage in the SM."*
- *"Yes if you have a good product and service people will come."*
- *"Yes however you need to have a lot of connections with your community, but for an online business you will need to use SM."*
- *"It's possible but it would be quite difficult for a new business which is not established."*
- *"I think social media will always enhance your chances of being popular because most of the youth especially use it. So my answer is no."*

It was interesting to note that even the majority of start-ups that do use SM, also stated that it is possible to run a business without the use of SM. Despite having used SM for their business, the start-ups still feel that a business could grow without SM. Only one of the start-ups disagreed and mentioned that SM use is vital for performing some start-up activities.

For all the participants who said yes, they suggested a condition for the replacement of SM. These were conditions like a good product, service, good connections and reputation and the potential to expand and go global. Therefore, although the start-ups alleged it is possible, they recommended substitute factors that will help start-up growth instead of SM.

These responses were interesting as the start-ups who have been using SM for their business activities have seen the potential of effective SM use. Yet, the majority still thought that it is not a necessity and start-ups can grow without it. When further questioned on their opinions on what their biggest factor of their start-up growth was. All of the responses apart from one mentioned word of mouth and business model as a key factor. As identified with the next question: What do you think was the biggest factor to your business success and why? There was one only start-up who uses SM, who mentioned SM as being the biggest factor to their success (see Figure 5).

As shown in Fig. 5, the majority of the responses from both the start-ups that do and do not use SM were in favour of Word of mouth and Business Model. This justifies the previous responses when the start-ups stated that SM does help, however, it is not a necessity. This also complements the themes identified when the start-ups described how the business model, service and reputation helps with growth more so than SM.

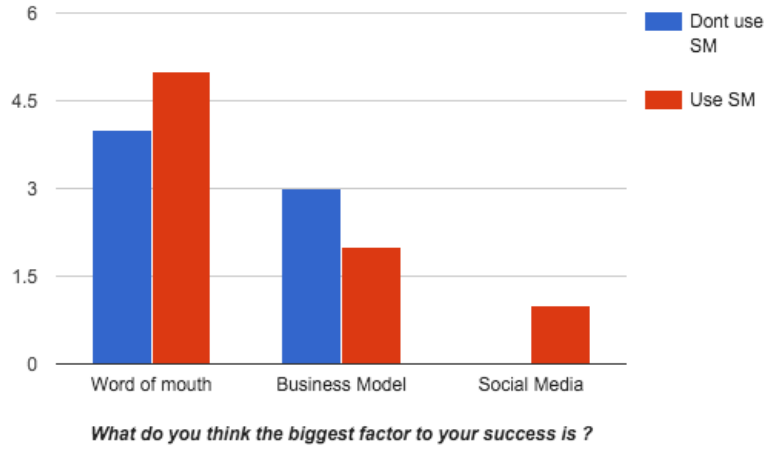


Fig. 5. What do you think the biggest factor to your success is?

5 Conclusion

The main findings from the primary research were as follows: Start-ups in Portsmouth that do not use SM lack seeing the need for using SM for their business activities. The main reasons why they do not use SM is the lack of awareness and technical knowledge of the potential it may bring. The start-ups see themselves as small businesses and have a perception that SM should be used for larger organisations. They tend to use more traditional approaches to marketing and advertisement (i.e. business cards, leaflets, word of mouth). The research identified that the most popular business activities the start-ups engaged in with the help of SM was Marketing and Advertising. They seem only to use SM for basic advertising and marketing activities but do not use SM to engage in any further engagements. The most common themes for the advantages of SM is the potential to reach a larger target audience and the generation of new customers. Furthermore, positive reviews on SM, benefits start-ups, however, it can also have a damaging effect on the image of the business. All start-ups that use SM unanimously agreed that they would not have achieved their

current growth and success without the use of SM. However, they struggle to manage and maintain their SM presence due to lack of funds and resources. This lead the majority of the responses from the start-ups mentioned word of mouth and business model as a key factor to their success. Indicating that there are other important factors start-ups should focus on rather than a SM presence. The majority of the start-ups interviewed said that it is possible to run a successful business without the use of SM and that it is not a necessity.

At present, the study is limited to the opinions of the start-ups, which can be problematic due to their limited knowledge as discussed earlier. Future research could try to get a deeper idea of what the start-ups know about SM in relation to their start-up activities. There could also be a further investigation on a larger number of start-ups.

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Understanding the Facebook communication contents in the banking sector: an exploratory study of the Italian listed banks

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Abstract. This study takes a first step toward understanding the Facebook usage by Italian banks to communicate with their customers. We examine the Facebook official pages of the Italian listed banks using a content analysis and posts categorization for investigating the main topics discussed. Our findings show that the main topics regarding marketing strategy, such as customer services and promoting social and cultural events. Overall, social media usage in the Italian banking sector is still in its early stages and there are opportunity for improvement Facebook usage in the relationships between banks and customers.

Keywords: social media, Facebook, banking sector, content analysis.

1 Introduction

The Web 2.0 tools represent the last step in the communication strategy using by organizations. In particular, social media applications, such as Facebook, create new opportunities for firms to improve the interaction with stakeholders such as customers, business partners, and suppliers [1]. Moreover, the deepening financial crisis has increased the need for companies to communicate with stakeholders to develop relationships of trust and to improve their image and good name [2].

The economic and financial conditions, as well as the recent banking scandals, have led several International Organizations to promote greater banking disclosure for improving the transparency [3] but also the public debate on banking transparency in order to reduce the likelihood of banking crisis [4].

The attention to the transparency in banking sector is rising worldwide as well as the need for regulating the disclosure of information, which is at the base of the transparency process. In particular, in the EU context is recognized the importance of mandatory e-disclosure in the banking sector through a specific regulation of the content of the corporate webpage.

In the last years, many banks have added to their official website (e-disclosure) also several social media to communicate whit customers (such as Facebook, Twitter,

and YouTube), as additional form of on line communication and for the improvement the transparency process. In the banking sector, social media has become an important tool to interact with actual and potential customers and manage reputation, to engage with fans and help build affinity towards the brand, and to promote the exchange and sharing of information [5; 6]. Morgado (2013) [6] have shown that banks may use social media in a variety of ways, including marketing, facilitating applications for new accounts, inviting feedback from the public, and receiving and responding to complaints.

This study takes a first step toward understanding the Facebook usage by Italian banks to communicate with their customers. Using content analysis and posts categorization on the Facebook pages, we analyze topics posted by banks to understand the communicative practices and types of use by them. The sample is composed by the Italian listed banks that have a Facebook page at 30 April 2015 (http://www.verafinanza.com/classifica-delle-banche-italiane-quotate-nella-borsa-italiana-2015/). We focused on Facebook because is the social media that dominates the web landscape and is the application mainly used by banks [7].

The structure of this paper is as follows. In the next section we deepen the role of transparency in the banking sector, and then we introduce the literature on social media usage by banks (section 3). In section 4, we describe the research methodology and the results of the analysis. Finally, in section 5 we present the discussion and conclusions.

2 The banking sector: transparency and disclosure attitude

Changes in the global economy have affected the institutional setting in several industrial sectors. These changes indicate a new direction in looking at accountability and transparency [8]. This phenomenon has triggered strong pressure on organizations pushing them to new disclosure practices. In fact, several international organizations and policy initiatives [3; 9] encourage countries to enhance bank disclosure in order to improve the transparency of the economic general systems.

Since 1998, the Basel Committee on Banking Supervision published a paper "Enhancing Bank Transparency" to exploring the significance of disclosure and transparency in the banking sector. This document underlined that it is not important the disclosure itself, but the topic and the information disclosed [10].

In this direction, Haniffa and Hudaib (2004) [11] explored the disclosure practices of the financial institutions trough a content analysis for underlining the topics mainly disclosed. Using a similar methodology, Sobhani et al. (2009) [11] analyzed the Corporate Social and Environmental Disclosure practices of several banks and other firms. Findings showed that the main topics are related to: human resource, consumer and product, community, environmental, and general.

Some scholars argued about the consequences of greater disclosure and transparency on the banking system stability [e.g., 13; 14; 15], showing that a good disclosure could limit the banking crisis [16], facilitate the efficient allocation of resources, and reduce informational asymmetry [4].

According to Bonsòn and Escobo (2002) [2], there are three types of reasons that motivate managers to improve voluntary disclosure in order to enhance the firm' visibility [17] and they are: (i) to reduce the risk of moral hazard, in line with agency theory the reduction of moral hazard should reduce the agency costs and then to contract all costs [18]; (ii) to highlight to the market the actual quality of the firm's securities [19; 20; 21] and (iii) to offer additional information that is not available through mandatory disclosure so that investors can reduce their cost of transacting [22].

Many scholars [4; 23; 24; 25] identified the informational asymmetry as the main reason of crisis in the banking sector, called bank panic [4].

The Information Communication Technologies (ICTs), particularly Internet, have greatly facilitated of distributing and accessing banks information of different natures, both financial and non-financial, promoting the information disclosure (mandatory and voluntary), transparency and accountability.

There are several studies that investigated the information disclosure trough web tools by financial industry. For example, Bonsòn et al. (2006) [26] analyzed the degree of information disclosure via web pages by European financial organizations. Branco and Rodrigues (2006) [27] investigated the role of the Portuguese banks' web sites as tool to disclose social responsibility information. Lipunga (2014) [28] evaluated the level of online corporate social responsibility disclosure by banks in Malawi.

Therefore, the advent of the web has induced the banks, and firms in general, to redesign their disclosure strategies because Internet usage for providing information can give "a competitive advantage over competitors who do not provide Internet disclosures" [29, p. 37].

3 Social media usage in banking sector

Bonsòn and Escoba (2002) [2] have shown as the Internet usage by organizations is changed during the time. At the beginning, firms had as priority "to be present on the web", then, Internet has become a tool to information disclosure. Nowadays, companies use the new web applications (e.g., social media) mainly to interact with stakeholders in a simple and cheap way. Hearn et al. (2009) [30] highlighted that trough the social media usage, companies can relate with new stakeholders who were previously inaccessible or invisible using traditional communications media. Therefore, the online relationships have become very important for the survival and prosperity of the organizations [31].

The social media represent for banks a critical channel through which to add relationship value by offering increased opportunities for customer engagement [32]. Social media usage in banking sector has become an interesting marketing tool to manage contact and interaction with their actual and potential customers [6]. In particular, The EFMA (2013) [7] research showed that Facebook usage by banks is mainly aimed to monitor and respond to customer comments and complaints [32].

The financial institutions investigated by Özeltürkay and Mucan (2014) [33] use Twitter and Facebook to improve their facilities and customer service. Bonsón and Flores (2011) [29] analysed as financial institutions are using Web 2.0 technologies and social media to transform their corporate disclosure. The Goi's (2014) [34] study highlighted that Malaysian banks use social media specially to support the product development or product innovation, to enhance the customer experience and service level, to enhance the firm's image, to promote new corporate strategies and to advance a transparency policy. Morgado (2013) [6] evaluated the use of Facebook by the top 200 international banks, showing that there are important differences in the use of this social media among the different banks analysed. Findings of this study showed the principal drivers of the social media usage by banks individuated are: customer engagement, building of brand awareness, improve customer retention and service, for new client acquisition, and marketing.

4 Research method and data analysis

We analyzed the Facebook official page of all Italian listed banks to explore how the latter use social media in the external communication strategies. Although the Italian listed banks are 17, only 8 of them joined to Facebook, such as Intesa San Paolo SPA, Unicredit SPA, Ubi Banca SPA, Banco Popolare SPA, Fineco Bank SPA, Banca Popolare di Milano SPA, Banca Monte dei Paschi di Siena SPA, Credito Valtellinese SPA.

Data was collected from official Facebook officiale page of the Italian listed banks during the period from the 15th of February to the 15th of May 2016, while data coding took place towards the end of May 2016. In particular, we collected all posts of the 8 selected banks and then performed data by using a qualitative data analysis software, such as NVivo. It was recognized as a particularly suitable software to aid qualitative data management and analysis for social research [35].

Before performing data analysis activity, data collected was manually codified for assigning topic tags to the posts uploaded on Facebook fan pages. In particular, we manually evaluated and codified the first 50 posts uploaded for each bank of our sample. Then, we automatically codified data in restrictive way by using the topic tags previously created. All posts codified were subsequently checked for relevancy.

Table 1 contains the aggregated final results for our sample.

Table 1. Descriptive analysis of the Italian listed banks' posts

Bank	Posts uploaded	Topic tags	Codified posts	% of codified posts
Intesa San Paolo	4,935	21	228	4.62
UBI banca	479	25	191	39.87
Monte dei Paschi di Siena	385	25	249	64.68
UniCredit Italia	932	21	93	9.98
Banca Popolare di Milano SPA	160	19	87	54.37
Fineco Bank	1	1	1	100.00
Gruppo bancario Credito Valtellinese	403	17	111	27.54
Banco Popolare SPA	0	0	0	-

With reference to the Intesa San Paolo bank, Table 1 shows that the posts uploaded were 4,935, of which 228 were codified by using 21 topic tags. With reference to UBI bank, NVivo allows us to upload 479 posts and to codified 191 by using 25 topic tags. Monte dei Paschi di Siena bank has uploaded 385 posts, of which 249 were codified by using 25 topic tags. With reference to UniCredit Italia bank, of 932 posts uploaded we codified 93 by using 21 topic tags. Banca Popolare di Milano bank has 160 posts, of which87 were codified by using 19 topic tags. The Facebook fan page of Fineco bank has just 1 post uploaded and codified by using 1 topic tag. With reference to the Gruppo bancario Credito Valtellinese, the posts uploaded were 403, of which 111 were codified by 17 topic tags. Finally, Table 1 shows that the Facebook page of the Banco Popolare SPA has not posted comments.

Based on the prior literature [8, 36], we also classified the codified posts into 6 categories, such as a) corporate governance; b) promoting social and cultural events; c) banking products and services; d) brand and reputation; e) customer services; f) others. Corporate governance consists of the set of mechanisms, processes, and relations used by management to direct and to control organization. Promoting social and cultural events refers to the set of initiatives organized and/or sponsored by bank for supporting social and cultural campaigns. Banking products and services consists of the set of personal's and corporate's banking solutions allowing customers to meet their financial needs via WWW. Brand and reputation consists of the set of marketing strategies and communication methods aimed to improve company's image and to distinguish it from competitors. Customer services consists of the set of initiatives for

assisting people in making better use of a banking service by providing information and documentation about a specific request (customer complaints and assistance). Others is a residual category that embrace all topic tags considered unrelated with the prior ones.

Table 2. List of categories for Italian listed banks

Bank/	Corporate governance	Promoting social and cultural events	Banking products and services	Brand and reputation	Customer services	Others	Total for Bank
Intesa San Paolo	16	20	20	39	76	57	*228*
UBI banca	4	62	19	26	22	58	*191*
Monte dei Paschi di Siena	35	89	32	28	25	40	*249*
UniCredit Italia	6	19	19	3	15	31	*93*
Banca Popolare di Milano SPA	8	0	32	5	18	24	*87*
Fineco Bank	0	0	0	0	1	0	*1*
Gruppo bancario Credito Valtellinese	11	14	53	14	5	14	*111*
Banco Popolare SPA	0	0	0	0	0	0	*0*
Total for category	*80*	*204*	*175*	*115*	*162*	*224*	*960*

Table 2 shows that posts uploaded on the Facebook official page of the Italian listed banks concern information about: corporate governance (80; 8.33%), promoting social and cultural events (204; 21.25%), banking products and services (175; 18.23%), brand and reputation (115; 11.98%), customer services (162; 16.88%), and others (224; 23.33%).

Finally, we also stressed data for performing the most cited words. Figure 1 contains the word cloud in Italian language.

Fig. 1. Word cloud of the most cited words

Excluding bank's name and function words (such as determiners, conjunctions, prepositions, etc.), Figure 1 shows that the most 20 cited words are the following: banca (bank), ciao (hello), grazie (thanks), codice/i (code/s), numero (number), online, filiale (branch), sito (website), conto (bank account), nuovo (new), internet, servizio/i (service/s), http, accesso (login), clienti (customers), stato (position), carta (card), buongiorno (good morning), assistenza (assistance), and problema (problem, issue).

5 Discussion and conclusions

The aim of this work was to investigate what Italian listed banks communicate through social media. Using a qualitative methodology, this paper explored the social media usage by banks aimed to understanding the topics that are most discussed on Facebook.

Our research reveals some main conclusions. First, content analysis' findings have shown that main communication topics between banks and public are promoting social and cultural events and customer services. This result is compliant with previous research that are investigated the social media usage by banks [6; 7; 33]. Facebook usage aimed to promote initiatives organized and/or sponsored by bank, such as social and cultural events. Thus, the banks gain reputation and image, increase the engagement of the public, build more affinity towards the brand [6; 34]. Moreover, trough Facebook page the banks support people in making better use of a banking service by providing information and documentation about a specific request (customer complaints and assistance). In fact, with the customer services the banks directly interact with customers, improving trust relationship, and thus customers can express their views or feedback about bank services and new products [34; 39].

Second, the number of the Italian listed banks on Facebook is still very low, although the Italian listed banks are 17, only 8 of them joined to Facebook. In particular, Intesa San Paolo is the bank that uploaded more posts. Moreover, for some banks joined to Facebook, the activity levels on page is very low, for example Banco

Popolare SPA has not posted comments. Many banks have a profile on Facebook, but this is not properly managed. It seems that banks feel urgency to have a Facebook official page to communicate with public, as a symbol of modernity, but do not draw appropriate and formalized social media strategies and policies.

Overall, findings highlighted that social media usage in the Italian banking sector is still in its early stages and there are opportunity for improvement in the Facebook usage as a marketing tool. In fact, our study could help banks managers to understand the main communication topics with public and, thus, adapt the communication strategies in terms of style, language, and content. In this way, banks could focus on content management on Facebook page and on information provision that properly addresses different users' needs. For example, our findings showed that an of the main communication topics between banks and public is customer services. However, banks should gather and use the feedback of public to improve their services in order to fully realize the potential of these social media tools. In the same way, banks should use appropriate measures to encourage public to use social media for interaction and communication.

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The Internet of Things as a Tool for Enhancing the Manufacturing Sector: An Organizational Perspective and Research Agenda

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Abstract. Early experimentation and analysis indicate that the Internet of Things represents a potential new paradigm shift from traditional manufacturing to "smart manufacturing". Given this scenario, we propose an analysis of IoT from an organizational perspective, with a view to defining a future research agenda. First, we provide a brief macroeconomic overview of IoT innovations, describing the factors driving their development as well as currently unresolved issues. Second, we outline the potential of IoT to enhance manufacturing via new business models and production paradigms. Third, we discuss the critical challenges associated with implementing IoT models, in terms of the organizational traits, work organization, workforce characteristics, change management, and organizational relationships required for the potential of IoT to be fully realised. Finally, we discuss promising lines of enquiry and theoretical frameworks for future research programmes, with a view to defining an organizational research agenda with the power to address emerging organizational opportunities and issues in the area of smart manufacturing.

Keywords: Internet of Things, Manufacturing, Logistics, Industry 4.0, Smart Manufacturing, Smart Factory, Big Data, HR Analytics, Change Management

1 Introduction

The basic concept underpinning the Internet of Things (IoT) is the possibility of connecting objects to the Internet, typically by means of a small and inexpensive "smart label". The transition from a world of objects to a world of smart objects that may be connected, identified, and monitored in real time paves the way for radical innovations in the field of manufacturing: a development known as Smart Manufacturing (also referred to as Industry 4.0, Factory 4.0, Smart Enterprise, Industrial IoT). Over the past five years, Smart Manufacturing has gained significant momentum in terms of the number of companies pursuing it, levels of investment, internal impact and productivity benefits, as reported by a body of analytical studies [1, 2, 3, 4]. **Number of companies involved**. For example, one study indicates that the deployment of IoT by businesses has grown by 333% since 2012, reporting that

65% of companies sampled deployed IoT technologies in 2014 (compared to 15% in 2012) [5]. **Investment levels**. Furthermore, investments in Industry 4.0 solutions are forecast to account for over 50% of planned capital investment over the next five years [4]. **Expected internal impact and productivity benefits**. Again, IoT is predicted to generate productivity gains of over 18% over the next five years, with estimated additional revenues averaging between 2% and 3% per annum [4]. However, it should be frankly acknowledged that the long-term impact of IoT is currently difficult to estimate. Early ongoing projects show that the potential of IoT for manufacturing may only be unlocked by adopting new, and still largely unexplored, organizational solutions at a range of levels, including new organizational structures, systems, processes, and relationships. Innovative people management and HR development approaches are likely to be key success factors in Smart Manufacturing initiatives, and this generates novel research requirements in the field of organizational studies.

The aim of the current paper is to examine this requirements, contributing to the development of an organizational research agenda. More specifically, we first provide a brief macroeconomic overview of IoT innovations, emphasizing the factors underpinning their development as well as currently unresolved problem areas. Second, we outline the potential of IoT to enhance manufacturing via new business models and production paradigms. Third, we discuss the critical challenges associated with implementing IoT models, in terms of the organizational traits, work organization, workforce characteristics, change management, and organizational relationships required for their potential to be fully realised. Finally, we describe promising lines of enquiry and theoretical frameworks for future research programmes, with a view to defining an organizational research agenda with the power to assess emerging opportunities for smart manufacturing and analyse the related organizational issues.

2 Background

IoT definition. The IoT has been defined as “a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on existing and evolving interoperable information and communication technologies (ICT)” [6:2]. A key aspect of IoT is that it adds an "Any THING” dimension of communication to ICT. This expands opportunities for things and systems to be controlled remotely, but more importantly enables direct – thing-thing, human-thing, human-human (non-computer-mediated), thing-computer and computer-computer – interaction while continuing to exploit the existing network infrastructure. All these forms of interactions are driven by data and, at the same time, also produce data that may be processed by advanced systems (using, for example, algorithms) designed to support (or substitute [7]) sophisticated human decision-making processes. Such “cyber-physical systems” – i.e., engineered systems that are built from, and depend on, the seamless integration of computational algorithms and

physical components [8] – include smart firms, smart homes, and even smart cities, and offer enhanced efficiency, efficacy, accuracy, flexibility and economic benefits.

A macro-economic overview of IoT. It has been observed that the IoT reconfigures the communication-energy-logistics circle in such a way that productivity is dramatically increased and marginal costs reduced. Consequently, IoT has the potential to boost a hybrid economy based on both the capitalistic and "Global Collaborative Commons" paradigms [7].

The recent growth in the IoT, privacy issues and further barriers. The IoT has only expanded significantly in the past five years [7, 9]. Up to 2010, many barriers hindered the growth of IoT, including the cost of sensors (such as tags and chips), gyroscopes and accelerometers, and the limited address space allowed by the IPv4 Internet protocol. However, as the cost of these components has decreased and the IPv4 Internet protocol has been substituted by IPv6, the IoT has seen major expansion. However, a highly critical aspect of the spread of IoT is privacy [10, 11]. Research has examined the complex challenges posed by personal security, technical security, and data protection issues, as well as by the current legal and standardization guidelines, all of which continue to slow down the broader diffusion of IoT [7, 9, 10, 11]. At the time of writing, policy makers are seeking to develop a common framework (see AIOTI, launched by the European Commission in 2015). Finally, two further aspects are currently working against the full release of the potential of IoT, at least in relation to its applications in the manufacturing sector. These are: continuing low awareness and knowledge of the IoT approach on the part of most managers, both in Italy and elsewhere [12]; second, a limited understanding of the organizational issues raised by IoT.

3 Exploring the potential of IoT: from data to action, via decisions

Agile decision-making processes. IoT technologies help to develop "agile decision-making processes" for descriptive, diagnostic, prescriptive and predictive purposes at three different levels: 1) at the operational level, with a view to running and managing formal procedures; 2) at the continuous improvement level, in terms of designing formal procedures to enhance efficiency, productivity, flexibility, and adaptation; 3) at the organizational development level, with the aim of fostering organizational learning and the development of new business models and markets. The case of DHL provides one of the clearest available examples of these diverse functions of IOT.

3.1. An illustrative case study

DHL has conducted wide-scale experimentation in applying the IoT to its logistics operations. As result, DHL's most sophisticated operating sites currently apply IoT systems in all three main areas of the logistics value chain: Warehousing, Freight Transportation, and Last-Mile Delivery Operations [3].

DHL Warehousing Operations and IoT: operation automation and optimization. With regard to Warehousing Operations, DHL has developed an IoT-

enabled smart-inventory management system based on pallet or item-level tagging. This involves the use of devices such as RFID, wireless readers that receive, aggregate and send data (gathered from each pallet as it arrives through inbound gateways) to the WMS for processing, as well as cameras attached to warehouse gateways that can also be used for damage detection (by scanning pallets for imperfections). Each movement of a pallet generates a tag transmission report that is sent to the WMS and, in the case of misplacement or compromised temperature / humidity conditions, an automatic alert enables the warehouse manager to take corrective action. During the outbound delivery phase, pallets are scanned as they pass through an outbound gateway to ensure that the correct items are being shipped (in the optimal order of delivery), and stock levels are automatically updated in the WMS. In addition, warehouse vehicles (forklifts) and equipment are connected, with a view to preventing collisions among them or with warehouse staff (in the next section, we discuss the organizational effects of the "augmented workforce"), monitoring their movements, position and operating conditions, and predicting maintenance needs.

Freight Transportation Operations and IoT: better tracking, SC risk management, capacity optimization and predictive maintenance. The opportunity to tag individual goods and items (not just the whole container) opens up new possibilities for Freight Transportation Operations also. Connected sensors on board trucks, and multi-sensor tags on individual goods, transmit data concerning items' location/condition, generating an alert if a package is opened (possible theft). By tagging each good, logistics providers not only maintain real-time and highly precise (metre by metre, second by second) visibility of the movement and condition of goods at the item level, guaranteeing a higher level of transport visibility and security (and reducing theft and acting against the organized crime that affects ports and rest areas). Moreover, IoT data integration is of value in handling natural disasters, conflict, economic uncertainty, and market volatility (see DHL Resilience360). Sensors can monitor how often a truck, container or ULD is in use or idle and transmit this data to a central dashboard for optimal utilization analysis designed to identify spare capacity along fixed routes and solutions for consolidating and optimizing routes. Finally, an electronically-connected fleet can also enable predictive asset lifecycle management (see MoDe project): this involves the transmission of data (via a wireless network) from a maintenance platform to a central unit in the truck, and then back to the maintenance platform for analysis. This means that the driver and/or maintenance crew may be alerted of potential problems in advance.

Last-Mile Delivery operations and IoT: optimization of daily collection routes, enhanced tracking, temperature sensing and return trip optimization. DHL has made major changes to its Last-Mile Delivery operations thanks to IoT technologies. These are the operations that take place during the final leg of the delivery journey, which is strongly labour dependent and characterized by high consumer expectations. In light of these features, IoT technologies can enable the logistics provider to develop a cost-effective solution. For example, DHL delivery operators can optimize their daily collection routes by skipping empty mailboxes (thanks to sensors placed in individual boxes). In the interest of offering a flexible delivery address service, tagged

parcels provide recipients with more detailed information about when their parcel is expected to arrive, giving them the opportunity to specify the delivery address at the last minute. In addition (although currently only in Germany), temperature-controlled smart lockers can replace traditional mailboxes and ensure "first-time every-time" delivery of parcels, groceries, and other environmentally sensitive goods. A similar scenario will apply to "smart home" products, which consumers are beginning to adopt. Finally, DHL is testing new business models for monetizing and optimizing the return trip, possibly by using IoT to connect delivery staff with surrounding vehicles and individuals.

3.2. IoT potential: improved productivity and quality, new production systems, new business models

As outlined above, the IoT approach enables agile decision-making processes by sustaining: operational tasks (in the case of DHL: the optimization of fleet and asset management; the real-time updating of inventory level data; and the real-time monitoring of a shipment's location-condition-security); continuous improvement (in the case of DHL: the elimination of time-consuming manual activities; optimized inventory and asset management, preventing costly out-of-stock scenarios; optimized energy consumption); and organizational development (in the case of DHL: temperature-controlled smart lockers enabled by e-commerce and developments in the smart home sector). From a broader perspective, such agile decision-making processes can potentially produce substantial added value for organizations at multiple levels.

Improved productivity and quality. The marked improvements in productivity and quality discussed in the DHL case study are just an illustration of a wide range of potential IoT-based innovations that may be implemented at any point along the value chain. In product development, for example, IoT technologies can help to achieve low-cost variability, evergreen design, new user interfaces and augmented reality, ongoing quality management, connected service, and system interoperability. In marketing and sales, they can support new ways of segmenting and customizing, and new customer relationships. In terms of after-sale service, they can enable the provision of remote service, preventive service and augmented-reality-supported service, and the gathering of valuable data from product users [13].

New production paradigms. IoT innovation in production gives rise to five main developments [13]. The first of these is the smart factory concept. A smart factory is a flexible network of cyber-physical systems that automatically supervise production processes and adapt their own functioning in real-time, in response to operating conditions. The connectivity and data-processing capacity of networked machines allow production processes to be radically optimized, minimizing downtime, costs and waste, and maximizing productivity, efficiency and security. The second outcome is simplified components: "the physical complexity of products often diminishes as functionality moves from mechanical parts to software" [13:104]. In the automotive industry, for example, the Volkswagen Group is moving towards the introduction of the virtual cockpit, in which car data may be viewed on a high-tech display. The third

development concerns reconfigured assembly processes: the use of standardized platforms secures economies of scale and lowers inventory. The fourth benefit is continuous product operations: smart and connected products include a cloud-based technology stack, which is a component that the manufacturer can improve throughout the life cycle of the product. Finally, a fifth spin-off of IoT technologies may be labelled "the new lean" [13, 12]: potentially, the data transmitted by connected products can facilitate the rationalization of product use and activities across the value chain, by reducing or eliminating waste, pre-empting the need for service prior to a failure, revealing that maintenance may be deferred, and reducing downtime.

New business models. IoT innovation can prompt the adoption of radically new business models and frameworks [14]. For example, according to one report [1], it appears that four new types of business model are emerging in the field of manufacturing: a) platforms (on which products, services, and information may be exchanged via predefined communication streams), b) "as-a-service" business models (in which technology and automation providers move from selling machinery to a pay-by-usage model), c) Industrial Property Rights-based business models (introducing modes of recurring revenue generation in addition to - or instead of - a one-off asset sale) and d) data-driven business models (that introduce new ways of collecting and using data either for direct monetization – such as Google's search engine, or the crowdsourcing of data whereby companies obtain services, ideas, or content via the contributions of a large group of people or online community – or for indirect monetization – using the insights obtained via IoT technologies to identify and target specific customer needs and characteristics).

4 Unlocking the potential of IoT: the organizational perspective

4.1. Inside the corporation: organizational systems, processes and structure

We believe that, in the IoT approach, a key source of competitive advantage is the organization's ability to fully exploit the potential value of the data generated during its operations. This requires conducting effective data analysis and using it to inform the decision-making processes governing organizational action and the management of uncertainty [15, 16]. Data gathered, produced and shared by the machines, components, devices and products involved in organizational operations are only potentially useful. They remain meaningless if they are not appropriately selected, understood and processed. In other words, IoT technologies introduce the potential to enhance both current and predictive decision-making processes [17], but this opportunity will only be realized if the company develops the specific organizational capability to use it to drive and regulate its operations. The experience of IoT pioneers proves that the greatest challenges associated with the IoT approach are, first and foremost, organizational.

Systems and processes. The radical enhancing of production systems described above may only be attained if organizational decision-making processes are appropriately redesigned and well integrated with internal operations. In the case of

DHL, for example, Warehousing, Freight Transportation and Last-Mile Operation – which comprise the entire life-cycle of the company's delivery service – have been closely integrated with one another: hence, the sharing of data among the three functions allows mutual regulation to take place. In other words, IoT requires a holistic enterprise management approach that breaks down traditional modes of organization and organizational silos. In manufacturing, the need for a global approach is particularly strong: here, for example, the IoT paradigm demands full integration among production systems and Enterprise Resource Planning (ERP) systems, Product Data Management (PDM) Systems, Product Lifecycle Management (PLM) systems, Supply Chain Management and Customer Relationship Management (CRM) systems. According to some analyses, the integration of systems that are usually managed independently of one another can facilitate gains in efficiency of up to 26% [1].

Organizational Structures. Nonetheless, this type of integration does not require replacing current systems with totally new systems. Rather, it implies redesigning organizational structure and operating systems in line with the holistic management perspective invoked above. The Candy corporation provides an interesting case study in the implementation of this crucial approach. Candy is known for its SimplyFi program, a wide range of smart home appliances that can communicate with the user via Internet (http://candysimplyfi.com). However, more saliently to our purposes in this paper, Candy has recently also changed its internal structure, introducing a new functional unit (labelled "Connect Unit") with the task of coordinating the entire IoT program. This unit collates and analyses marketing, IT, and Customer Relationship Management issues with a view to strengthening and coordinating R&D IoT programs. Similarly, the Bosch Group has created a specific unit (named "Bosch Software Innovations") charged with developing services for smart products by involving both internal product-based business units and customers [17]. More generally, it seems that at least three new types of organizational unit are emerging. First, Unified Data Organization Units. Porter observes that many companies are creating dedicated data groups with the function of consolidating data collection, aggregation and analytics. Such groups are responsible for making data and related insights available across functions and business units, and typically they are led by a C-level executive (the Chief Data Officer - CDO) who reports to the CEO (sometimes to the CFO or CIO). Ford Motor Company provides an example: it recently appointed a chief data and analytics officer to develop and implement an enterprise-wide data analysis strategy. Second, DEV-OPS Units, whose role is to manage and optimize the ongoing performance of connected products after they have left the factory. This type of unit brings together software-engineering experts from the traditional product-development organization (the "dev") with staff members from IT, manufacturing, and service who are responsible for product operation (the "ops"). Third, Customer Success Management Units are responsible for managing customer experience and ensuring that customers get the most from the product.

4.2. Inside the corporation: HR and people management

New work organization. In an IoT-enabled work environment, it is likely that most of the people in an organization will use non-traditional interfaces to interact with networks of things in advanced ways. In the DHL case study, for example, significant changes have taken place in the role and the activities of logistics staff: the workers' actions are embedded in the IoT system, with warehouse staff connected to the Internet of things via scanners, smart devices and wearables that receive and send data in real-time. Similarly, Caterpillar have developed a suite of tools including cameras for human-operated vehicles, which monitor driver fatigue by tracking key indicators such as pupil size and blink frequency.

Roles, competence and skills and the augmented employee concept. As work organization and environment are transformed by the drivers described above, roles, competencies and skills will be required to change dramatically. In terms of competencies, for example, companies need to differentially adapt the capabilities and skills base of their employees across a wide range of functions. At the shop-floor staff level, basic process and IT systems know-how are required to ensure the connection between the digital and physical sides of the operation. At a more general level, in-depth overall understanding of corporate processes, systems, and data is prerequisite to developing new business models and operational improvements based on cross-functional information. Furthermore, companies need data and process experts who can operate at the interfaces between functions and systems and are able to work in close synergy with subject-specific experts, such as shop-floor managers, customer relationship managers, and supply chain managers. When developing new data-driven business models, such data experts are required to play a key coordinating role in new product design, given their broad overall knowledge of the production chain.

In short, as processes and business models become more agile and data-based, employees will require completely new skills and qualifications. At the moment, we know little about exactly what competences will be needed. Companies that have pioneered IoT technologies in manufacturing say less on this crucial issue than on other topics for which key insights have already emerged. Nonetheless, in line with our analysis so far, it is reasonable to posit that an effective IoT work environment will have three main traits: specifically, it is data-driven, exploits collaborative workflows and is based on hands/eyes-free interaction. These characteristics will likely lead to the development of the "augmented employee". The role of humans will mainly concern data treatment and analysis, supervision and advanced decision-making. This will require a small number of highly skilled people focused on innovation and improvement; more generally, it will alter the workforce configuration required by the organization.

HR management innovations. From another perspective, the changes in the work environment and workforce profile just outlined, may only be obtained by transforming HR management accordingly. Bringing an IoT approach to bear on the HR function will include enhancing the performance management process and related compensation model, as well as agile working schemes, by drawing on data from IoT systems, while job design may take into account real workloads as measured via IoT

data collection. In addition, HR Analytics solutions may be appropriately integrated with IoT systems. Recruitment and Training & Development initiatives will need to take into account the new skills required by workers. Skills shortages will emerge in new areas (for example, in the availability of managers capable of leveraging Big Data analyses to make good decisions), and a new cultural mindset will be required to support collaborative data-driven work environments, enhanced leadership styles, agile working approaches, and virtual team collaboration. Nonetheless, the crucial issue at this point in time is that a Human Resources approach to the design and implementation of IoT systems has currently yet to be defined.

4.3. Outside the corporation: inter-organizational relationships and value networks

New inter-organizational relationships. IoT introduces the opportunity to share and integrate data, not only within individual companies, but also across different organizations. This has key implications for both traditional and new business models. Closer integration among the companies in the value chain can generate a wide range of benefits, such as enhanced organizational flexibility, greater customer satisfaction, faster times to market, a more efficient division of labour, and higher rates of innovation and speed. The great complexity of the current competitive scenario and the intense innovation efforts that it demands justify the need for cooperation schemes among groups of companies with complementary know-how. In the automotive industry, for example, manufacturers have begun developing interdisciplinary partnerships with suppliers from other industries (such as component manufacturers, chemical companies and, recently, companies such as Apple and Google). In short, IoT technologies, by sustaining horizontal integration and the creation of value-added networks across the value chain, introduce opportunities not only to develop new business models, but also to enhance and/or upgrade traditional business models.

The role of SMEs. A further key development enabled by IoT technologies in terms of new inter-organizational relationships and business models is the opening created for SMEs to play a significant role in the newly emerging business scenario. Arguably, SMEs will enjoy increased opportunity to introduce their businesses into supply chains by leveraging IoT systems. On joining forces with larger value chains, they will no longer be mere suppliers within Smart Manufacturing scenarios, but will become stable partners in Open Innovation streams [19]. SMEs have long been engaging with this challenge, but now have the opportunity to reinforce and accelerate the process of change [20].

4.4. Organizational change management concerns

The IoT approach requires organizational change initiatives aimed at introducing a holistic enterprise management approach that can not only accomplish the integration of all internal processes, but also develop new relationships with external partners across the value chain. One of the most crucial challenges for organizational change management is the need to integrate staff with different work styles from highly diverse backgrounds and cultures [13]. A further challenge is the increase in complexity caused by the need to significantly revisit organizational structure,

policies and norms. Finally, IoT will not only demand reconfiguration of the organization at the formal level, but also the appropriate culture, motivation, and level of engagement.

5 A suggested research agenda

In this paper, we have discussed the key organizational challenges associated with converting to IoT approaches: these include developing appropriate organizational traits, work organization, workforce qualities and change management strategies within Smart Manufacturing. The manufacturing sector is entering a new developmental stage with huge potential. However, this potential may only be fully harnessed by making significant changes at multiple levels of the organization in ways that are still largely unexplored. Thus, in the table below, we summarize the key areas of research and detailed research topics touched on in our analysis, also suggesting possible theoretical frameworks and a sample of bibliographical references.

Through this early contribution, although it is partial and limited in many ways, we hope to enrich the scientific debate in this new and highly promising field of investigation. We are currently designing an empirical study on the introduction of IoT. In addition to the theoretical frameworks proposed in Table 1, we are evaluating potential methodological frameworks. Two approaches appear to fit our research aims: for the preliminary exploratory stage, the traditional case study analysis approach [21], and for the following theory development stage, a grounded theory paradigm [22].

Table 1. IoT and Manufacturing: a suggested research agenda

Area	Key Research Topics	Disciplines / Theoretical Frameworks and Sample References
1- The IoT System: enabling technologies	• Security (low-complexity encryption, access control, secure data provenance, data confidentiality, identity management, privacy….) • Distributed intelligence (complex data handling, visualization, interfaces, multi-agent systems…) • Distributed systems (network protocols, naming systems, middleware, data dissemination, context awareness…) • Computing, Communication, Identification (low energy computing, energy harvesting, near-field communication, ultra-wide band, RFID, …)	Computer Science, Information Science, Systems Engineering IoT research [23]
2- Organizational Ecosystems	• New business models (BM); transformation of traditional business models • Transformation of the value chain (vertical and horizontal) • The role of SMEs in the enhanced value chain and new business models	• Business Model research issues [24]; BM generation frameworks [25]; BM Innovation [26]. • Interorganizational relationships; organizational networks; theory of the firm, IT-enabled organizational relationships [27]; dynamic firm boundaries in value chains [28, 29]; netchains [30] • Organizational research on SMEs; SMEs, innovation and organizational choices [31, 32, 33]
3- Organizational Structure, Systems and Processes	• Organizational structure changes (e.g., new functional units, impacts on traditional functional units, new C-Level roles, etc.) • Redesign and integration of internal processes (special focus on decision-making) • New approaches to integrating organizational systems • New lean management opportunities • 3D prints, wearables, smart devices/machines/components: roles and organizational impacts • Effective change management approaches	• Dynamic Capabilities and operations [34] • Impact of ICT on supply chain agility and firm performance [35, 36] • Transformation of management processes [37, 38] • Ambidexterity approach [39]
4- HR and People Management	• Work organization transformation and related effects on ∗ job design choices ∗ transformation of roles (new roles emerging, traditional roles modified/obsolete) ∗ competencies, capabilities and skills maps (for each organizational role) ∗ skill shortage issues and consequences in terms of recruitment and T&D initiatives ∗ main HR policies and practices (performance management, reward, career paths, etc.) • The "augmented worker" profile, traits and HR management • Links between IoT and HR Analytics approaches	• Effects of innovation on the strategy/HRM relationship [40] • Job design framework and choices [41, 42, 43] • Business, human resource analytics, and information technology [44, 45, 46]

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On the effect of IFRS 9 on credit risk management: a general assessment in the banking industry

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Abstract. The aim of this paper is to analyze the effects that the adoption of the new accounting principle IFRS 9, which in January 2018 will replace IAS 39, will produce on the financial reporting of banks and on the credit risk management activity. The study starts from the observation that regulation of the banking sector is characterized by a misalignment of aims between standard setters and bank regulation. While for the standard setters the disclosure aims to provide its stakeholders with clear, truthful and correct information regarding the economic and financial situation of the company, the objective of the bank regulations is to protect the financial system by trying to reduce the frequency and the costs of banking crises [1]. Such differences, coupled with the recent financial crisis, have generated a debate involving various institutions (EFRA). Basel Committee on Banking Supervision (BCBS) in response to which International Accounting Standards Board (IASB) has introduced the new standard IFRS 9 on impairment [2].

Keywords: Financial reporting, Accounting, Credit Risk Management

1 Introduction.

One of the main events involving banks in the last few decades was probably the adoption from 2005 of international accounting principles. The European Union, despite the considerable perplexity manifested by politicians and banks, endorsed, from January 2005, the IFRS standards for publicly listed financial institutions.

The main criticisms of the adoption of such principles were due to the transition from an accounting regime based on the prudence principle to a system centred on transparency and based on the logic of fair value. The main critique concentrated on the fact that fair value accounting would imply irrational bubbles in expanding periods amplifying downswing movements in contracting periods of the cycle [3, 4], because to disclose fair value results based on distorted market prices can lead to market overreaction and amplify contagion [1].

The financial crisis accentuated the negative effects of the adoption of such an accounting regime on banks to the extent that the IASB changed the accounting rules at the height of the crisis [5]. In October 2008 the IASB declared: "the IASB is committed to taking urgent action to ensure that transparency and confidence are restored to financial markets" emending IAS 39. As a consequence banks were allowed to reclassify assets from the fair value to the historical cost category.

A further weakness observed during the financial crisis of the late 2000s related to the use of the incurred loss method of loan loss provisioning. The main criticism of such a method refers to the moment in which the loan loss expenses are recognized in the balance sheet.

Consequently, the International Accounting Standards Board (IASB) and the Financial Accounting Standards Board (FASB) replaced the incurred loss methods of loan loss provisioning by a more forward-looking expected loss method introducing in July 2014 the IFRS 9 "Financial Instruments". The current incurred loss models proposed in IFRS9 require banks to assess whether there is any objective evidence that a financial asset (or group) is impaired. If there is an objective evidence that an impairment loss on a loan has been incurred, the amount of the loss needs to be calculated.

The adoption of the new accounting principle will imply important change at level of information system. The main change is due to the complex implications across multiple dimensions of the Operating Model. It will determine an increase in the flows of information required for items evaluation. The passage from an incurred loss model to an expected loss one requires to consider both information regarding past events and forward-looking information. Such a change implies an improvement in the quantity and quality of information processed. Critical became the activity of standardization of all the internal information and the acquisition of external data so to implement sophisticated statistical model to assess the right level of risk to associate to each position [6, 7]. The whole process has to be automatized so to reduce subjectivity and the leading time.

2 Research questions, Sources and Structure

The present work can be considered a position paper of a wider research project aimed to assess the impact of the introduction of new accounting rules in the measurement, valuation and disclosure of information concerning non performing loans in banking industry. The research, in particular, focuses on the main effects that the adoption of the new principle IFRS 9, which in January 2018 will replace IAS 39, will produce on the financial reporting of banks and on the credit risk management activity.

The main objective of this work is to analyse the contribution of IFRS 9 to improving the quality of the loan portfolio (i.e. to preventing NPLs) of banks. The recording of losses in a forward-looking perspective, on which the new principle is based, is in fact a guarantee of a more balanced and prudent treatment of banks' credit

exposure, with the prudential provision obligation also for performing loan, although limited to default risk cover for only one year following provision of a loan.

The paper can be positioned within the body of financial accountingand accounting information sytems studies [8]. According to Mancini [9] each change concerning the methods of evaluation of accounting items determine significant impact on the flows of information required and consequently on the structure of information systems. Corsi and Mancini [10] underline the role of IAS/IFRS because they act more directly on the balance sheet and on Accounting Information system with consequent impacts on the data processing, on the accounting procedures, on the skills and on technical tools.

Thanks to information technology it's possible to process big flows of data (internal and external) applying sophisticated statistical model so to achieve, in real time, complex elaboration based on multidimensional models.

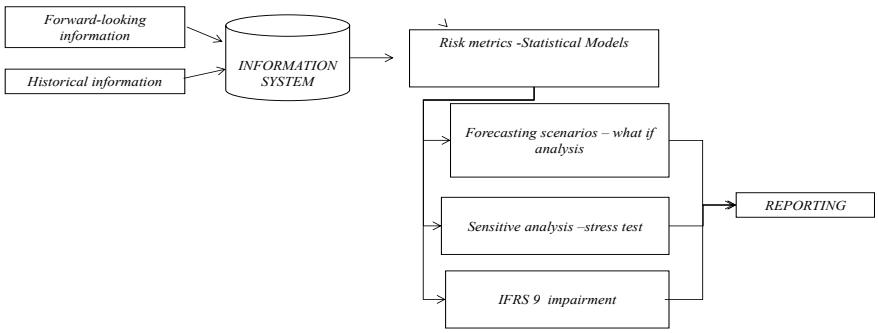


Fig. 1. The theoretical framework (Source: our data processing)

The choice of concentrating the analysis on the banking sector derives from the special nature of its activities. In such an industry lending, unlike what occurs in non-financial sectors, being considered a financial activity, falls within the sphere of application of IFRS 9. The issue is moreover particularly interesting in the light of the radical change in the logic underlying assessment (incurred versus expected loss).

The primary aim has been subdivided into three sub-aims each of which investigates the effects of the adoption of the new standard will have on one particular aspect of management.

The research questions that the study will try to answer are the following:

1. What will be the effects of the adoption of the new impairment model in the area of first time adoption?
2. What will be the effects of the adoption of the new impairment model in the area of measurement?
3. What will be the effects of the adoption of the new impairment model in the area of assessment?

The sources used are of a both primary and secondary type.

The primary sources used are the IFRS9 principle and the documents released by the Basel Committee. The secondary sources are the main national and international literature.

The remainder of the paper proceeds as follows. Section 3 provides an analytical literature review; Section 4. Identifies the nature of the context for the application of the IFRS 9 principle in banks; Section 5 identifies the main changes that will be determined by the adoption of the IFRS 9 principle in credit assessment; Section 6 analyses the effects that will be determined by the adoption of the accounting principle on recording, measurement and assessment activities. Our conclusions are presented in the last section.

3 Literature review

There is a renewed interest in the analysis of credit risk in the banking industry [11, 12, 13, 14] with a debate on the perceived weaknesses in accounting standards and practices that contributed to loss of confidence in the system during the recent financial crisis [1, 15, 16]. The interest goes beyond the mere academic literature involving accounting bodies and banking regulatory authorities. A critical subject under discussion is the delay under the incurred-loss approach in recognition of impairment arising from credit losses and, consequently, the various and possible changes in how expected credit losses might be reflected at the initiation of a loan [17].

The accounting representation of the assessments of loan loss provisions depends on several factors; 1) on the physiological risk of the various types of borrower; 2) on the "nature" of the accounting model adopted for identifying loss, point in time or forward looking deriving from credit position impairment.

The forward-looking models confer greater discretionary power on the evaluator, but require for the process of forecast determination more detailed information in particular with reference to the definition risk of the individual debt position and the entire loan portfolio [18]; with reference to the latter aspect, the quantification of provisions indicates, indirectly, the ability of management to price adequately the credit granted in relation to the degree of risk associated with it, on the assumption that the provisions must find the necessary cover in the spread on the rate applied on each type of borrower. The considerable attention paid to the forecast of provisions in the area of the accounting measurement of performance and of the assets of the bank depends on the use of elements of a judgemental nature, of evaluations and forecasts which management is required to carry out and which leave a wide margin of discretion that can distort the accounting representation of the enterprise, by virtue of earning management manoeuvres. Empirical evidence of how provisions on loans have been used for purposes of earnings management are provided by the studies of Greeawalt and Sinkey (1988), Wahlen (1994), Leaven and Majnoni (2003), Liu and Ryan (2006) [19, 20, 21, 22]. To limit such a phenomenon the IAS 39 accounting principle has taken on, at a fundamental level of the value loss forecast process, a logic of the "incurred" type, offering the possibility of identifying impairment

situations only when specific loss events occur. At the same time, however, several studies [23, 24] have shown how the "incurred" model leads to a structural delay in the identification of losses and therefore less prudence in the estimate of profits, given the existing asymmetry in the identification of credit economics. To this it should be added that such a model has proved to be characterised by a strong procyclical stimulus, given that considerable adjustments are required precisely in the phases of negative economic trend [25]. In this sense the new standard setter goes in the same direction as the Basel III rules, being suited to reducing the possible procyclicality of the system of impairment identification [26]. Many studies and much empirical research have drawn attention to the procyclical effects of the loan loss provision models [21, 27, 28]. In the Report of the Financial Stability Forum (FSF) "Addressing Procyclicality in the Financial System" [29], loan loss provisions are identified in the context of three elements that have contributed to intensifying the mechanism of propagation of the financial conditions in the real economy?

Because of the connections existing between provisions and regulatory capital, another perspective for which the loan loss provisions are relevant, is that of the stability of the bank, from a micro and macro-economic viewpoint. At microeconomic level, prudential regulation pursues the objective of ensuring that the bank operates with its own means capable of guaranteeing healthy and prudent management: adjustments on loans, by influencing the determination of regulatory capital, can determine a decrease of the liable equity capital through both the reduction of profits recorded in profit and loss account and the deduction of the shortfall of the adjustments with respect to the expected loss. From the macroeconomic point of view, the value adjustments play an important role in safeguarding financial stability, due to the close connections that exist between the banking and financial systems. The choices regarding provisions are affected by the trend of the economic cycle, determining a procyclical effect according to the accounting model used for the forecast "point in time" models that are also anchored to logic of an "incurred" type can require considerable adjustments at the worst moment of the economic cycle; in this way reducing asset levels and incentivizing a reduction in loans in order to guarantee capital adequacy [30]. Such a deleveraging mechanism, replicated at system level, can determine situations of credit crunch, thus exacerbating the adverse economic downturn. On the other hand, "forward-looking" accounting models, favouring the possibility of considering forecasting elements, allowing the creation of adjustment buffers in the phases of economic growth, to be used during economic downturn. The many exhortations by international bodies, including FASB, G20, Financial Stability Forum (FSF), Financial Stability Board (FSB), Basel Committee on Banking Supervision (BCBS), have led IASB to develop the international accounting principle IFRS 9 containing a new impairment model founded precisely on a "forward-looking" logic, for the determination of loss on loans, able to identify promptly losses in value of the credit portfolio without having to wait for loss events to manifest [31]. The new impairment model, which will be introduced from 2018, reflects requirements of both financial reporting disclosure [32] and of convergence with the prudential regulation to which banks are subject [33]. Indeed, the transition to an impairment model founded on the logic of "expected loss" was the aim openly

declared by the Basel Committee and contained in the recommendations that the same had communicated to the accounting standard setters during the phase of drafting and definition of the accounting principle IFRS 9 [33].

The realignment of accounting logic with regulatory logic appeals the activity of risk management, that has always been oriented towards the determination of risk parameters for the precise definition of asset requirements, the logic of which can be used also for accounting purposes for the implementation of the new impairment model.

4 The adoption of the IFRS 9 principle in banking industry

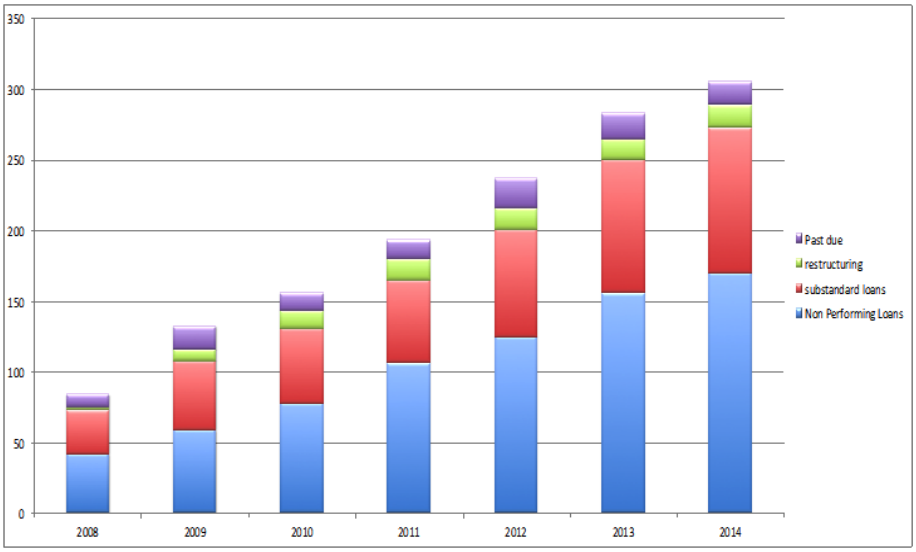
The change from an "incurred loss" impairment model to a model of an "expected loss" type provided for by the IFRS 9 represents an important point of convergence between accounting discipline in banks and the prudential discipline of the national and supranational supervisory authorities. What is clear is the trend towards a logic of application of the general criterion of prudence [34]. The Basel rules and those of international accounting principles, as is well known, pursue different aims, which can recognize respectively in the safeguarding of the stability of banks and of the financial system as a whole and in the definition of the criteria of correct and truthful representation of business efficiency. For this reason the objectives are different: the aim of the regulations produced by the Basel Commission is the definition of the minimum measure of asset resources that guarantee compliance with the principle of healthy and prudent management of supervised organizations; the aim of the IFRS 9 accounting principle, among other things, is the classification and evaluation cred oriented towards a correct and faithful representation of the financial position of the bank in relation to the losses that have occurred or are expected [35].

The prudential distinction between expected and unexpected loss and the assumption that the expected loss must be covered by balance sheet adjustments is difficult to reconcile with the current impairment model provided for by IAS 39 which, as is well known, is based on an incurred loss approach. The incurred loss approach prohibits accounting for expected losses and leaves considerable discretionary power of manoeuvre in the use of trigger events that identify a situation of impairment. This translates into the possibility of implementing opportunistic manoeuvres aimed at postponing the identification of credit value losses. The IAS 39 therefore has the effect of deferring accounting for expected balance sheet losses [36]. The new IFRS 9 will make possible, on the other hand, an identification of impairment that is more rapid and based on forward –looking evaluations. In this way banks will be able to allocate allowances in the face of expected losses and create capital buffers to be used at times of downturn in the economic cycle. In this sense the new standard achieves the same goals as the Basel III reforms: to reduce possible procyclicality of the impairment identification system [37].

The idea that future profit margins were always sufficient to cover the intrinsic risk of performing credit exposure, unless a trigger event occurs, has determined a "cliff-effect" in bank balance sheets, that has led to strongly procyclical movements, not

adequately anticipated in terms of provisioning for covering financial risks. Consequently the considerable increase of non-performing loans (NpLs) occurring in the last decade, accompanied by an upward movement in prolematical loans, as shown in table 1 [38].

Table 1. Trend of non performing loans in Italian banks 2008-2014 (Source: Abi Financial Outlook, 2015)



The loan loss provisions models, in the presence of economic downturn factors, can have a negative impact on asset levels, bringing about, among other things, the reduction in loans, a necessary condition for maintaining adequate asset coefficients.

Regarding credit, the IFRS 9 brought about a quantum quality leap with respect to the past. Adapting the credit portfolio to the new schema of devaluations at three levels (cfr. Section 5) requires both the development of new measures of risk and their calibration/validation on the basis of increasingly extensive and robust data.

In this way the risk parameters already present in a bank for purposes of risk management (RM) will be enhanced and the dialogue between the areas of financial reporting and of risk management will resume. Such areas, despite both being engaged in the definition of risk parameters for predicting unexpected losses, pursue different objectives. Accounting is oriented towards the need to defer the identification and recording of incurred loss in the balance sheet. Risk management, on the other hand, is concerned with the definition of risk parameters able to identify promptly the downgrading elements of the debtor for the constitution of adequate provisions in the face of the occurrence of unexpected losses. The Credit area develops scoring matrix or acquires solutions from external providers aiming for

decisions reached by resolution that cannot be reconciled with expected loss measurement needs. The same indicators used are different: cost of risk, time to approval, time to cash and operational costs for the Credit Area; algorithms and deviations between forecasts and financial statement for Risk Management. The introduction of the IFRS 9 that envisages the forward-looking determination of losses actually defines a reconciliation between accounting efficiency and RM efficiency and a necessary coordination between the areas.

From the point of view of the organisation and management of the processes it will be necessary to establish a relationship of collaboration in order to identify in advance the anomalous behaviours of the debtor such that they impact on the economic risk of the loan but also on the provisioning modes to be used in the financial statement. Risk management will be engaged in the development of ”lifetime” parameters for the probability of Default (PD), for the Loss given default (LGD) and for Exposure at Default (EAD), for the identification of which a link-up between the capital measurement tools already present in banks and other tools for evaluating the impact of the economic cycle on credit risk. Equally the accounting function will have to take responsibility for the definition of first adoption criteria simulating and managing the relative economic and asset repercussions.

5 On the effect of IFRS 9 on credit risk management

The new standard IFRS 9 was introduced to reduce income smoothing by adopting a more prudential approach [39]. The new standard answers to the IASB’s objective to reflect the economic substance of lending and loan losses through an approach that proposes recognition over time [17]. Expected-loss-based accounting for the impairment of financial instruments: the FASB and IASB IFRS 9 Approaches.). It replaces the incurred impairment model applied in IAS 39 with a new one based on the expected loss method.

Such a perspective implies for the International Accounting Standard Board (IASB) a change in the logic inspiring evaluations. The principle of prudence that constitutes a cornerstone in the traditional Italian financial statement approach and has been pushed into second place with the introduction of international accounting principles, today takes on new life and importance.

In the international framework the principle of prudence characterizes the reliability of accounting information, without a result having an autonomous value as happens in our system. The principle of prudence has been severely criticised by the Anglo-Saxon doctrine [40, 41] considering it in some cases to be restrictive of other fundamental principles such as accrual.

The IASB accounting system in fact admits the recording of profits and costs at moments preceding the traditional one of final realization for entering them in the balance sheet. As a consequence the fair value evaluation method has become, above all internationally, the reference evaluative criterion in place of the more traditional historic cost.

The logic on which the expected loss model envisaged by IFRS9 is based is, on the other hand, forward looking the adoption which requires banks to use a wide range of internal and external data and information, including macroeconomic factors, in the process of credit evaluation [42]. Unlike IAS 39, with IFRS 9 we have an impairment model common to all assets. This involves the elimination of the complexity derived from the use of multiple impairment approaches. The intention of IFRS 9 is to offer stakeholders relevant information regarding the sum total, time and degree of probability of future cash flows. The model, unlike that required by IAS 39 needs recognition of the expected credit losses at all times without deferment until there is evidence of a credit event.

IFRS 9 envisages an impairment model based on accounting for expected loss in the sense of difference between contractual and discounted expected cash flows, for performing and under-performing loans at the original effective interest rate, for default loans at an effective interest rate adjusted for risk. IFRS 9 envisages a three stages approach (three buckets) considering changes in credit quality from initial recognition. While in IAS 39 loans were divided into two categories (in bonis and in default) with the possibility of segmenting the portfolio for purposes of collective devaluations, with the new model an intermediate category was introduced (stage 2). The transition from one stage to another is made possible in both directions (downgrading and up-grading). In the impairment model envisaged by IFRS 9 the three categories (stages) correspond to distinct methods for the calculation of losses and interest.

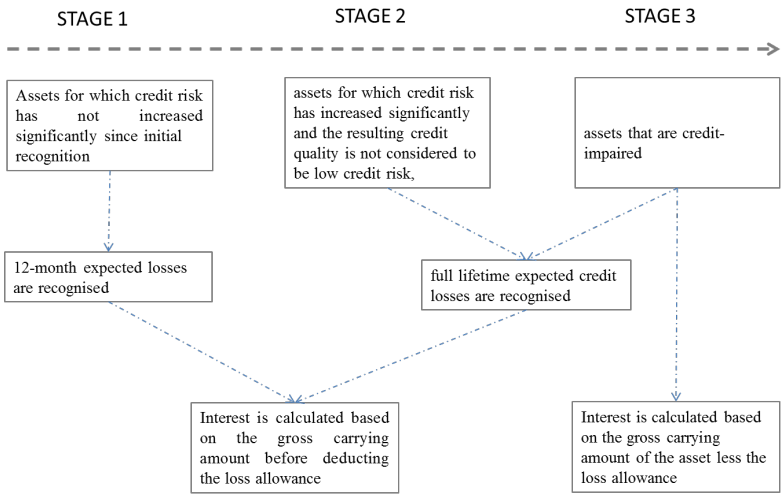


Fig. 2. The three-bucket model (source: our data processing)

The first stage category refers to the class of performing loans constituted by credit in the initial state and by those values not subject to an increase in credit risk with respect to the initial evaluation. Indeed IFRS 9 states that if "at the reporting date, the

credit risk on a financial instrument has not increased significantly since initial recognition, an entity shall measure the loss allowance for that financial instrument at an amount equal to 12-month expected credit losses" Banks have always to measure the Expected Credit Loss (ECL), based on robust methodology and management's experience in credit judgment, for all their lending exposures so as to identify, promptly, changes in the credit risk [43]. The Expected Credit Loss estimate, as defined by IFRS 9, is the probability-weighted amount that should reflect the possibility that a credit loss will occur. The accounting principle defines the Expected credit losses as values which "shall reflect the time value of money. In particular, they shall be discounted to the reporting date using the effective interest rate (EIR), except for purchased or originated credit-impaired financial assets, in which case the credit-adjusted EIR is applied (IFRS 9 par. 5.5.17, B5.5.44–B5.5.48).

It's also specified that the maximum period to consider when measuring expected credit losses is the "maximum contractual period (including extension options) over which the entity is exposed to credit risk and not a longer period, even if that longer period is consistent with business practice (IFRS 9 par. 5.5.19, B5.5.38 – B5.5.40)

For the assets belonging to the first bucket the value adjustments are, consequently, based on the calculation of the expected credit loss due to default events that are possible within 12 months after the reporting date (ECL – 12 month). For performing loans, unlike what is laid down in IAS 39,a prudential fund limited to the risk of expected loss in the following twelve months. The interest revenues are calculated on the basis of on gross carrying amount.

A critical point is understanding of the meaning to be attributed to the concept of "12-month expected credit loss". IFRS 9 defines it as the "portion of lifetime expected credit losses that represent the expected credit losses that result from default events on a financial instrument that are possible within the 12 months after the reporting date". Other more prudential positions [43] consider it more appropriate, on the other hand, to extend the concept to "the expected cash shortfalls over the life of the lending exposure or group of lending exposures, due to loss events that could occur in the next 12 months" [43]. The same concept of expected credit loss can generate misunderstandings. It is defined by IFRS 9 as the total loss weighted by the probability that it will occur in the next 12 months, while others link the concept to the expected cash shortfalls [43]. The notion of 12-month expected credit losses cannot in any case be associated with positions that are expected actually to default in the next 12 months. For assets that are expected to have increased their credit risk lifetime credit losses (LCL) are recognized and they are downgraded. If the increase in risk is circumscribed to a particular category of loans and attributable to factors of a political-economic nature, these should be dealt with in stage 2.

The second stage (stage 2) includes assets exposed to a significant increase in credit risk since initial recognition (under-performing), even if no objective evidence of impairment is provided. To evaluate the significant increases in credit risk internal rating models or external sources are used or the rebuttable presumption is adopted that the credit risk has increased significantly (since initial recognition) when contractual payments are more than 30 days past due. For this kind assets a reserve fund is envisaged the sum of which corresponds to the expected losses lifetime

resulting from possible default events over the expected life. Although ECL is recognized, interest revenue is still calculated on the gross carrying amount of the asset. When credit is first extended the initial creditworthiness of the borrower and initial expectations of credit losses are taken into account in determining acceptable pricing and other terms and conditions. The lifetime expected credit losses are recognized only after a significant increase in credit risk (complying with initial recognition) because in the initial stage the variable risk is included in the policy of pricing. To recognize lifetime expected credit losses only after a significant increase in credit risk better reflects the impact of an economic loss in the financial statement. If the level of risk of loans increases further and there is concern over the risk of default, these should be downgraded to stage 3.

The third bucket (stage 3) deals with financial activities that present objective evidence of impairment (default). For such assets the adjustments in value are determined by using the concept of lifetime- expected credit loss and the net accounting of the interest.

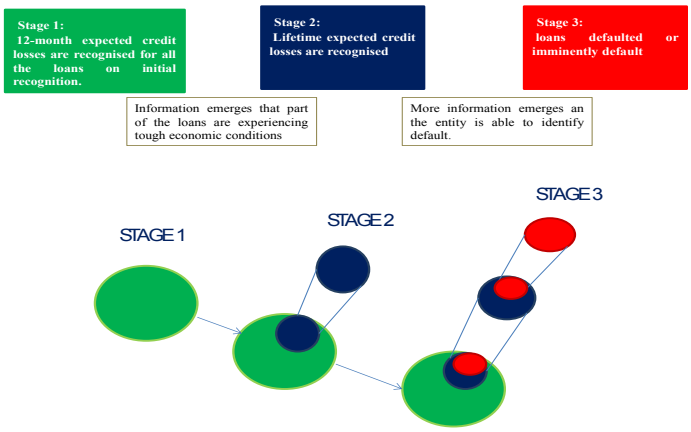


Fig. 3. The Expected Losses Model (source: Our data processing)

With respect to the default positions the IFRS 9 principle does not provide a definition entrusting each entity with the definition of default coherently with that used for internal credit risk management, specifying in paragraph B5.5.37 the rebuttable presumption that the default does not occur later than 90 days past due. The Basel Committee assumes a sceptical position towards what is established in the accounting principle regarding the rebuttable presumption, assuming a more prudential position. The Committee recommends that the definition of default adopted for accounting purposes are guided by the definition used for regulatory purposes provided in paragraph 452 of the Basel capital framework [43]. According to the Basel framework a default event is linked to the occurrence of one or both the following criteria:

1) A criterion of a qualitative kind linked to the unlikeliness to pay: "The bank considers that the obligor is unlikely to pay its credit obligations to the banking group in full, without recourse by the bank to actions such as realising security".

2) An objective criterion corresponding to the rebuttable presumption of the IFRS 9 principle "the obligor is past due more than 90 days on any material credit obligation to the banking group".

According to the approach of the Basel Committee the criterion of "unlikeliness to pay" would make it possible to identify default before the exposure becomes delinquent with the 90-days-past-due criterion acting as a backstop [43].

With respect to the problem of the measurement of ECL the IFRS 9 principle emphasises that an entity should reflect:

(1) the probability-weighted outcome. The expected credit losses should be relate to the probability that a credit loss occurs and to the possibility that no credit loss occurs.

(2) the time value of money principle. The expected credit losses should be discounted to the reporting date.

(3) a reasonable and supportable information available without excessive cost or effort including information about past events, current conditions and forecasts of future conditions. Even if the model proposed by IASB is based on a forward-looking approach, the adoption of an historical perspective is considered basic to measure expected credit losses. Historical data should be read on the basis of current information to reflect the effects of present events to forecast future conditions. Also if not specified by IFRS 9 an entity may use various sources of data: internal or entity-specific and external.

6 Analysis of the main impacts resulting from the adoption of IFRS 9

The effects of the adoption of the new impairment model can be divided into three main categories:

a) classification (first time adoption)
b) measurement
c) evaluation/financial reporting

The effects are, in general, transversal with respect to the various business functions, involving several areas such as risk management, accounting, processes and organization and information systems (cfr. Figure 4)

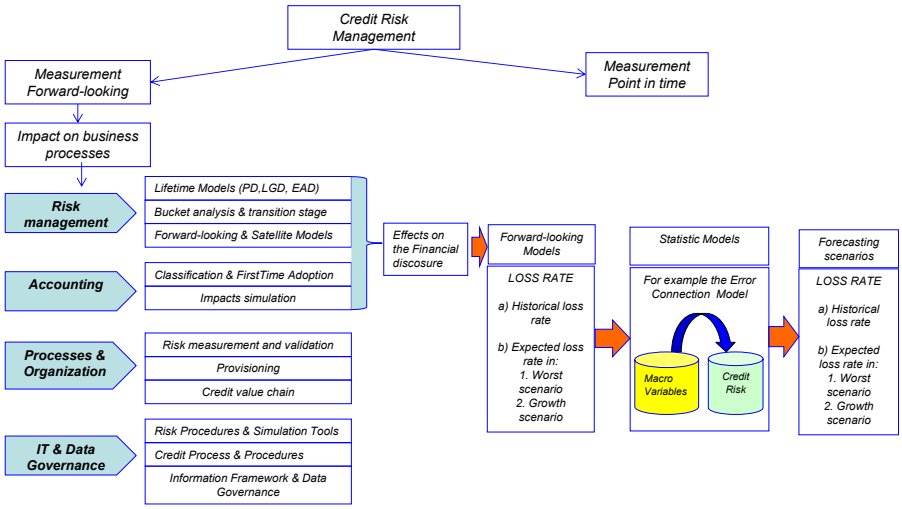


Fig. 4. The macro roadmap illustrative of the areas involved by implementation of IFRS 9 (source: our data processing)

One initial problem can arise at first time adoption. The entities will have to able to determine the credit risk of all exposures at initial recognition in order to compare it with the present one. The entity might find itself dealing with incomplete information, especially regarding less recent assets making the activity of evaluation non-immediate. In such a case alternative indicators could be employed, including the ratios used as triggers in the context of asset quality review for purposes of supervision. Should the quantification of the initial risk value be impossible or excessively difficult, the entity will be able to avail itself of the principle of low risk exemption envisaged by IFRS 9 by demonstrating that the credit risk is modest. Otherwise the entity could hypothesize a significant risk by observing immediately a reserve fund equal to the expected lifetime loss. One or other of the options determine significant impacts on the profit and loss account.

With respect to the possibility of recourse to low risk exemption envisaged by IFRS9 the Basel Committee assumed a particularly sceptical position, hoping for a minimum recourse to it [43].

With respect to the activity of measurement the transition to a lifetime risk evaluation system represents a transition charged with implications. Scholars [44, 45, 46] have highlighted the need to develop models for calculating the ECL based on publicly available data linked to banks' credit risk.

The IFRS 9 principle envisages that an entity "when measuring expected credit losses, […] need not necessarily identify every possible scenario. However, it shall consider the risk or probability that a credit loss occurs by reflecting the possibility that a credit loss occurs and the possibility that no credit loss occurs, even if the possibility of a credit loss occurring is very low" [IFRS9 par. 5.5.18].

The Basel Committee, in accordance with Basel Core Principle 17, expects banks to evaluate and, if necessary, modify, during the transition period, their existing

processes and systems to collect and analyze relevant information affecting the assessment and measurement of ECL.

The internal rating systems and the stress tests created for purposes for management, as initial implementation of the agreement on credit (Basel II) and of directive 2006/48/CE, and then developed with Basel III, can therefore represent the natural point of departure for the calculation of expected credit life. Such systems can today be of three types:

Standardized, that is, external rating systems certified by the supervisory authorities (Standard Methodology).

Basic internal systems constructed by individual banks where the Probability of default (PD), the Loss Given Default (LGD) and the Exposure at Default (EAD) are measured with parameters established by the authorities (IRB Foundation – FIRB).

Advanced internal systems where both the PD, and the LGD and the EAD are estimated internally – forecast (IRB Advanced – AIRB).

In terms of impacts on financial disclosure the application of the new accounting principle will involve particularly clear effects for assets included in stages 1 and 2.

With respect to stage one there will be a change from an approach of collective devaluation based on the creation of a doubtful debts provision for values that have already undergone a loss event even if not yet identified by the internal monitoring system, because of delays in the procedure, to an approach based on the preventive identification of risk. This will involve estimating loss risk in the following twelve months entering in the annual financial statement a doubtful debts provision with the relative provision entered in the statement of assets and liabilities. Such a devaluation, in accordance with IFRS 9 and Basel Committee [43], requires the preventive identification of transfer criteria constructed on the basis of the information set internal and external to the bank able to capture the downgrading of the debtor or to identify other indicators linked to the PD of the counterparty. The table below shows some examples of transfer criteria.

Table 2. Possible transfer criteria (source: our data processing)

	Macro classes	Criteria
Information set of data external to the bank	Market indicators	1. Variations in the rate of unemployment 2. Variations in the rate of inflation
	Level of market rates	1. Variations in the market interest rates
Information set of data internal to the bank	Economic and financial indicators of the debtor	2. Reduction of sales revenue 3. Contraction of profit 4. Contraction of assets 5. Increase in degree of leverage
	Other information on the debtor	1. Request for extraordinary financing 2. Drastic reduction in the value of collaterals 3. Drastic reduction in the value of annual turnover 4. Drastic reduction in the estimates of future cash flows
	Rating dof the debtor	1. Downgrading 2. Default (according to regulatory definition) 3. Reduction in a year of 50% of the equity of the debtor following losses
	Trigger AQR	1. Change in DSCR (Debt Service Coverage Ratio) 2. DSCR <1
	Forbearance events	1. Events that involve the need to modify the terms and conditions of the loan
	Trend and compositioin of the credit exposure	1. Indicators of regularity in payments 2. The trend and compositioin of the credit exposure 3. External ratings

For the information flows regarding the debtor and the macroeconomic and sector data to be integrated automatically and efficiently and for the construction of the transfer criteria it is necessary for them to be made available through IT solutions. Such solutions must balance data quality, updating rapidity and control of costs. In any case the transfer criteria system must be set up in such a way as to avoid the application of the impairment method being influenced by elements of excessive volatility, in order to contain as far as possible any unexpected effects on the bank's balance sheet.

7 Conclusions

This work contributes to the debate over the new model of impairment introduced by IFRS 9 in the banking industry. The emphasis of work in progress paper is on the novelty of the work, not completeness.

We have focused on three main issues:

the relevance and importance of the process of adaptation of accounting rules to a prudential approach for which an information set is necessary to be able to support the impairment process;

the general assessment of implementation methods of impairment IFRS 9;

the potential benefits of introduction of the IFRS 9 principle as well as the main key risk indicators that the RM uses to promptly identify the impairment of asset quality.

This work concludes that the change from an "incurred loss" impairment model to a model of an "expected loss" type represents an important point of convergence between the discipline of the banks' balance sheet and prudential regulations of the supervisory authorities.

The new standard setter will reinforce the effective enforcement capacity of the supervisory authorities to monitor the correctness of the application of the accounting criteria. The use of properly designated proportionate approaches should enable the banks to adopt sound allowance methodologies commensurate with the size, complexity, structure, economic and financial significance and risk profile. Secondly, this work has attempted to contribute towards the understanding and use of a methodological approach that aims to exploit the synergic relationship between Accounting functions and RM, the latter engaged in the definition of risk indicators, for the implementation of the new impairment model more in keeping with the business model adopted by the intermediary. The Basel Comittee of Banking Supervision (BCBS) expects that a bank's consideration of forward-looking information will be supported by a sufficient set of data. In the BCBS's view the information used shall include an unbiased consideration of relevant factors and their impact on creditworthiness and cash shortfalls. Relevant factors include those intrinsic to the bank and its business or derived from external market conditions. In the BCBS's view, consideration of forward-looking information is essential to the proper implementation of an ECL accounting model, and should not be avoided on the grounds that a bank considers the cost of incorporating forward-looking information to be excessive or unnecessary or because there is uncertainty in formulating forward-looking scenarios.

Although this work contributes to the debate over the new model of impairment, it could be further developed in a number of ways:

empirical analysis of how the activity of supervision of the evaluation of the quality of banking assets in a bank considered "significant" or "less significant" can contribute to the verification of the accounting correctness of the value adjustments of expected loss;

qualitative and quantitative enquiry, aimed at analysing the managerial impacts and the state of implementation of the principle in “significant” or in “less significant” banks;

empirical analysis aimed at highlighting levels of criticality and limits of smaller sized banks and for credit consortia, considering that such categories of intermediaries present to date difficulties of know-how, of adequacy of the information systems and of budget, restricted temporal margins of implementation.

This paper reports on a study which aims to add to theoretical understanding of how and why banks use IFRS in their strategies. The material from this paper can be used as the basis for future research as long as there are "significant" revisions from the original.

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The application of Virtual Personal Assistants as tools to facilitate learning

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Abstract. This paper discusses the potential benefits of utilising an intelligent assistant to support the learning process for individuals exploring a new subject area. The paper will explore the concept of a Virtual Personal Assistant (VPA) being part of a collaborative learning process with the end user supported by external data sources. In particular, the constructivist teaching philosophy could be adopted within a socio-technical relationship between student and intelligent system to enhance the joint learning process. We hypothesise that individuals will benefit from the support of this proposed type of VPA, with its ability to help structure complex data in a way that relates the subject area to what the end user already knows.

1 Introduction

In recent years there has been a rise in popularity of intelligent personal assistants for both professional and personal use. With instances of this technology such as Apple's Siri becoming standard on iPhones [1] and Microsoft's Cortana being released on Windows mobile devices [2] and Windows 10 [14], most people now have access to an intelligent personal assistant in some form. As their popularity increases more and more companies are investing in this type of technology, with Amazon releasing '*Echo*' [15] and google developing their own '*Google assistant'* [16]. An intelligent personal assistant learn from interaction with users, and as their exposure to the population increases, so does the potential for these intelligent systems to provide useful and meaningful responses to the user.

Within this type of technology is the concept of a Virtual Personal Assistant (VPA), systems that are focused on supporting the end user as an individual rather than supporting the organization that provides the system. By interacting with one specific user the system is able to build a personal relationship by learning to provide responses that are intended to be relevant specifically to that user. As intelligent assistants are capable of varying their outputs between relevant responses (rather than always using what is viewed as the most relevant response), it is able to expand and

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explore related information to what the discussion is focused on. As the tool learns to respond appropriately from its end user but with this variation, it will begin to imitate their perspective without copying it. This provides a relevant second perspective to the end user that is able to engage in the discussion and exploration of a complex problem space. As the end user engages in interactions with the system they too will learn to better interact with the tool through the development of this personal relationship. The outcome of this is a continuously evolving relationship of two perspectives that are able to collaboratively explore problem spaces [17].

One area that we have identified that could potentially benefit from this technology is education and the process of supporting a independent professional in learning information in an effective way. In particular we have identified one teaching method, the concept of constructivism, as an approach that could potentially be applied through the application of VPAs as a supporting tool. Constructivist teaching involves a relationship between the teacher and the student where the teacher is aware of what knowledge the student has on a subject. This means that both the teacher and the student benefit from continually learning together to make sure this method of teaching is effective.

Within this paper, we will be exploring the potential benefits of using a new style of VPA as a tool to support seeking out new knowledge and learning from it in a way that relates the information to what the user currently knows. We will explore the concepts behind the VPAs capability to provide support to an individual, the potential application of the constructivism philosophy, and will discuss the benefits and issues with this approach.

2 Scenario

To exhibit the capabilities of this type of technology, we will define a scenario to describe the tools application area. Within this scenario, the user knows what subject area they want to explore and learn, but have limited or no prior knowledge within that area. The practitioner has access to vast external data sources, such as information available online, that contain both reliable and unreliable sources for the subject they are investigating. The userhas to make informed decisions about which sources of data are reliable and then has to explore the information in a way that they learn about the subject in a productive manner.

The introduction of a VPA into this scenario can create a collaborative learning process that utilizes the similar perspectives of both the user and the tool to better discuss and explore the subject area. As VPAs develop a personal relationship through discussions with the user they will be able to gain a background knowledge of what the user already knows. This personal aspect of this relationship is important

as it will allow the user and VPA to explore new data and relate it to what is already known.

When exploring external data sources however, the VPA would struggle to be able to make informed decisions about the reliability of data sources it is retrieving. While to a human some websites may immediately come off as suspicious or bias, this process does not come as easily to intelligent systems. To assist the identifying of reliable data sources, the contextual meta-data of each source could also be retrieved to help the end user make the informed decision about its reliability and perspective. Once reliable sources of data have been identified, the VPA and the end user will be able to discuss and explore this new information with similar perspectives, leading to a better understanding of this new information by relating it to what the end user already knows.

In the following sections of this paper, we will discuss the key principles behind the VPA and this approach to engaging in collaborative learning with the end user. We will begin by discussing the categories of support that we have identified in past papers, and how the development of a personal relationship benefits the end user. This section will also highlight the other more commonly categories of support and explain the differences between them. Following this we will discuss the core philosophies behind constructivist learning. Within this section we will talk about what this approach normally consists of, how it can be applied to VPAs, and how this union could provide new benefits. Next we will examine the issue of retrieving reliable data sources with the VPA and looking at the concept of "super information" as a way of building a basis for an end user to make informed decisions about the reliability of information. Lastly, we will discuss all of these elements combined into a continuously evolving collaborative learning experience and the benefits and issues that we could see arising from this.

3 Context of support

The way an intelligent assistant handles and stores data provided by a user is the categorised by a different context of support provided by the system. A categories of support infrastructure has previously been proposed [3] and provides an effective way of identifying the differences between systems with a similar function but with different contexts of support.

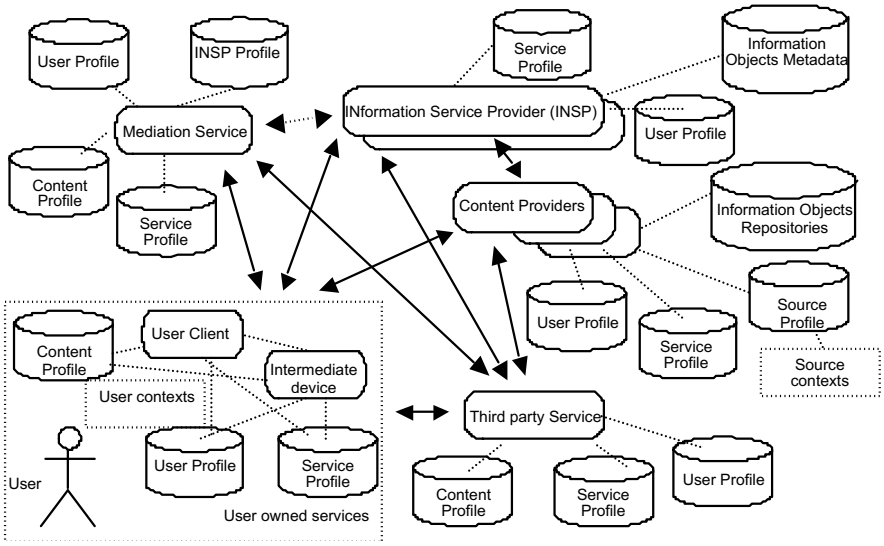

Fig 1. Categories of support infrastructure [3]

With intelligent assistants becoming commonplace on personal devices we are reaching a point where large numbers of people are training the software through conversations and interactions. This type of intelligent system falls into the information service providers category and the context of the support it provides can be defined as "systems that support the user by carrying out requests but also provide support for the organization behind the system " [4]. Systems within this category generate data by the analysis of the activities of the users and this data is owned and controlled by the organization that has provided the system. The responses and reactions to users are then tailored to groups of people with similar interests, learning to interact with a type of person, not an individual. In turn this loses the personal relationship aspect and although it can provide somewhat relevant responses to large numbers of people it lacks the context that is born of a personal relationship with an individual.

A VPA on the other hand learns in the same fashion but only interacts with an individual, developing a personal relationship and putting control of the data in the end users hands. Responses provided by user owned services such as this are refined by its knowledge of the individual to focus on the context of the end user.

"The support system does not only have local data and libraries, it also develops metadata and contextual data as a result of use analysis and history of interaction with user. All of contextually developed content in the data library is owned and under the control of the end user." [4]

The difference in relationship is comparable to the scenario of asking a friend for advice on a movie to watch over a website of movie recommendations. While the website will be able to give recommendations based upon people with similar interests, the friends personal relationship may provide insight into films you may like with less dependency on your previous film choices in the decision making process. The method used on the film website is still effective and it is the method used by some online retailers and advertisers. But due to its focus of support being on benefiting the organization as opposed to individuals, it provides recommendations based upon the trends in peoples interested, rather than that of the individual and this is potentially not the most effective way to provide contextually relevant and useful suggestions to the user.

Within the scenario of learning we are looking at however the VPA will have the capability to explore external data sources on behalf of the end user. Systems that retrieve information on behalf of the end user while not directly supporting the information provider fall within the support category of mediation services. We have previously described mediation services as "*systems that function as an intermediate system between the user and other services*" [4] and the systems focus is based around the retrieval of data, not specifically supporting end users. In this context the proposed VPA the data retrieval is a function provided for the end user, but not the main function of the system. The system will not attempt to consume the data into its libraries but will provide the reverent sources as discussion points to engage the end user with through conversations, leading to exploration of the data lead by the end user. This method of data retrieval will allow the VPA to bring up data to discuss with the end user but as it won't be changing the systems data libraries without discussion with the end user it preserves the personal relationship. Drawing external data into a discussion with the end user in this fashion allows both the user and the VPA to develop their understanding of the new data together.

4 Constructivist learning with VPAs

The philosophy behind the constructivist learning approach is based around taking into account what the student knows already [5]. Traditionally, with a baseline of knowledge to work from the teacher is able to focus the teaching activity on relating the new information to what the student already knows.

The constructivist approach, in theory, helps the student to develop a deeper understanding of the new information by linking it to things they are already familiar with. Understanding information on the relational level means the student is able to appreciate the significant of the information within its relevant context [6] [7]. This relational understanding of information builds the foundation of a level of understanding that could allow a student to generalise and transfer the principles of what they know to expand their knowledge of related subject areas.

An issue with approach is that the teacher needs to learn about the student as the student learns too, requiring the teacher to continually engage the individual student. This level of mutual engagement is difficult to maintain when a teacher may be expected to teach a subject to a class of around 30 students and the effectiveness of the method will decrease as the students' knowledge moves further away from the teachers baseline. A strength of introducing VPAs as a supporting tool in this role is that it would require much less resources to pair each student with software such as this than it would to have their own personal tutor. The tools themselves would not be able to replace the effectiveness of a personal tutor, but could function as a foundation to utilize this learning style from and enhance the students learning process.

5 The retrieval of reliable and contextually relevant data

The retrieval of information from online sources could be a very useful function for the VPA to have to support an end users learning. Such functionality has existed for many years, ranging from programs such as personal web crawlers that retrieve information for a user to programs that utilize search engines and bring back related pages to your inputs. A major limitation of this function however is determining the reliability of the source of the data when retrieving information about a complex problem space.

"*Without access to rich contextual material (in addition to content) autonomy cannot be achieved as the learner will not be in a position to make responsible judgements about usefulness. Complexity arises because the needs of the individual are neither constant nor given, but created through a process of continual and contextual rediscovery" [8]*

For a human user, determining the reliability or context of data can be achieved by analysing the data's source itself. This analysis is formed by comparing the information about the data source to the users own unique experiences and the perspective that has been constructed from this. This is described with Langefors infological equation "I=i(D,S,t)" [9].

"*Meaningful information (I) may be constructed from the data (D) in the light of participants' pre-knowledge (S) by an interpretive process (i) during the time interval (T)*" – [8]

Users can quickly navigate data sources by assessing the contextual information and focus on exploring the useful and relevant information to their subject. For example if a study is presented that finds a link between certain foods and a healthy life style, a search into the relationship between the authors of the study and the foods

in question may provide information that is useful when considering any possible bias of the study.

This is where the concept of ‘super information’ comes in. Super information is a second order of metadata, providing information about the data’s point of origin and source of the data, rather than information about the data itself. An intelligent assistant would be unable to reliably make decisions on the validity of data sources by the utilization of this kind of information. What a virtual personal assistant could do however is retrieve the ‘super information’ around a source and bring it back to the end user to allow them to make informed decisions about which data sources are useful. This means that although the VPA is not able to access and utilize the users pre-knowledge (S) and interpretive process (i) it is able to feed them ‘super information’. By presenting the ‘super information’ alongside a data source gives the end user the opportunity to apply their own sense-making to the data.

6 Discussion

Once a user has a VPA with a personal relationship they have constructed through discussions and identified external data sources that are contextually relevant, the user and the VPA can explore the problem space together. The exploration of knowledge becomes complex due to the ever changing requirements of the user who will continually want to explore new data to expand their learning as their current knowledge grows. The VPA can tackle this by discussing the ambiguous problem space with the user and developing its own perspective of the problem that is developed through its experiences with the user. With VPAs ability to vary their outputs between different relevant responses based upon its own perspective, it can propose different areas of interest within the data for the end user to explore. In essence the VPA is used as an intelligent system that helps to structure the learning environment with the use of contextual information for the end user to explore.

Looking back at our scenario, the application of intelligent systems in this way could provide focused support to the user on a number of aspects of the learning process. The user looking to learn and the VPA access the external data sources and through the retrieval of meta-data, the user is able to interpret the super information to determine which sources are reliable and relevant. Once a data source has been identified as reliable by the end user, the VPA would then be able to use its natural language processing skills and knowledge of the end user to begin a collaborative learning session.

As the discussion begins the user will be able to being to explore information using their “pre-knowledge” as a foundation for where to relate this new information. The discussion serves to teach both the user and the VPA, as the user gains new

knowledge and knowledge of the VPAs perspective, the VPA also builds its own knowledge based upon where the user steers the conversation. The leading of the conversation can be two way however, as the VPA has the ability to respond using relevant information that may open up new avenues within related subject areas to explore. The intention behind this mutual exploration of information is that the perspectives of both the VPA and the end user will identify areas of interest within contextually relevant data that the other may not have considered. This difference in perspective is the product of the continuously evolving cycle of adapting that develops a personal relationship between user and VPA. With new relevant avenues to explore within the ambiguous or complex problem space of the learning material, the VPA will facilitate the user in learning from contextually relevant data at a relational level.

7 Conclusions

With the personal relationships with VPAs and their ability to continually adapt through interaction with the end user, this concept of a VPA could potentially become a useful facilitator of learning. Specifically, the socio-technical relationship between student and intelligent assistant could provide enhanced learning through adopting the constructivist teaching philosophy as an approach to collaborative learning between VPA and user. The enhanced learning comes in the form of the system helping to structure the problem space in such a way that the user can explore the data and learn by relating it to what they already know.

Currently, the type of VPA discussed within this paper does not currently exist in a form that can be both useful and usable enough to encourage the construction of a relationship with a user and then explore problem spaces in this way. Many of the core principles of this technology however do exist, and examples of this can be seen within different systems that are available today. This includes learning from the end user [10], learning from external data sources [11], discussions on the effects of end user data control [12] and the utilization of constructivism with intelligent systems [13]. There is no technological reason why in the future these principles could not be combined into one system with the goal of supporting an end users learning and this area would benefit from further investigation.

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Technology enhanced CS50

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Abstract. CS50 is Harvard Colleges introductory computer science course, that is enrolled mostly (94%) by students that have little or no prior programming experience. Building on the experience related to the online training for the Italian and International Olympiads in Informatics, we propose to adopt a customized version of `oii-web` in teaching CS50 like courses. `Oii-web` is an interactive online system, integrating the programming problems and the grading system used in several major programming contests, including the International Olympiads in Informatics (IOI).

1 Introduction

CS50[3] is Harvard Colleges introductory computer science course, where many of the students face computer programming for the first time; it is also available for free in the MOOC platform EdX. In this paper we will use CS50 as the model of introductory courses to computer science that require computer programming; this (long) list includes also, for example, Stanford's CS101[4], also freely available in Stanford Online Platform, and MIT's 6.00[5] (Introduction to Computer Science and Programming), also freely available on EdX.

Most notably, these three mentioned courses differ in the computer programming language they use to teach computer programming: CS50 focuses mainly on C (using Scratch to introduce programming, and with some aspects of Web Programming addressed with PHP, SQL, HTML, CSS, and Javascript), CS101 uses a custom version of Javascript, and MIT6.00 is built on python. Isn't it surprising? Probably three of the most important courses in introduction to computer science and programming do not agree on the language chosen. But we do believe that, on the other side, these courses share a clear effort in trying to remove all the unnecessary obstacles that a beginner has to face before being able to write its first program: CS50 uses Scratch, a free visual programming language developed by MIT Media Lab to introduce programming concepts, CS101 created its custom version of Javascript to allow users to code inside a

[3] https://cs50.harvard.edu
[4] https://cs101.stanford.edu
[5] http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-00sc-introduction-to-computer-science-and-programming-spring-2011/index.htm

browser, and MIT6.00 is built on python, whose evidence as a good introductory programming language is well known, see e.g. the list of references in [14].

So, why do we focus on CS50? Besides the fact that it is also the model of the secondary school course AP CS50[6] [4], we use CS50 as our model due to the documented effort, in the literature, of Prof. David J. Malan to explain its choices and improve the course over the years, both in the content and in the supporting technology [11–13].

As we will see, we aim at providing more engagement to the students of CS50 (and related courses) by using a web based platform that derives from the one used to train students for the International Olympiads in Informatics (IOI) and the Italian Olympiads in Informatics (Olimpiadi Italiane di Informatica - OII). The International Olympiads in Informatics (IOI) are an annual programming competition, patronized by UNESCO, for secondary school students. First IOI has been in Bulgaria in 1989. Participants are usually the winners of national competitions. The 2016 IOI, held in Kazan, Russia, saw participation by 80 countries and 304 contestants (each country can have up to four contestants). IOI 2016 will be hosted in Kazan, Russia.

This platform, called `oii-web`, in turns has been built around on the *Contest Management System* (CMS, http://cms-dev.github.io/ [9, 10]), that is the grading system used in several programming competitions, including IOI and OII. More details about `oii-web`can be found in the works of Di Luigi et al. [5, 6].

Following a Design Science Research Methodology (DSRM), this paper attempts to describe the design and development phases of the platform, leaving the evaluation process to be detailed in subsequent work. This paper is organized as follows: the following section briefly describes the DSRM methodology. Then, following the DSRM methodology, the next three sections are devoted to the first three steps of DSRM. Conclusions and final remarks are addressed in Section 6.

2 The Design Science Research Methodology

The main goal of the Design Science Research Methodology is the creation of successful IT artifacts to solve a (well defined) problem [15]. The DSRM can be summarized in the following six steps (see also Figure 1):

1. *problem identification and motivation* − this includes knowledge about the state of the problem and the importance of its solution;
2. *definition of the objectives for a solution* − after the previous step it is necessary to infer the objectives of a solution and what is possible and feasible;
3. *design and development* − this step includes the definition of the artifact functionality and architecture, and its creation;
4. *demonstration* − in this step it is demonstrated the capability of the artifact to solve one or more instances of the problem (e.g., through experimentation, simulation, case study, proof, or other appropriate activity);

[6] http://cs50.wiki/

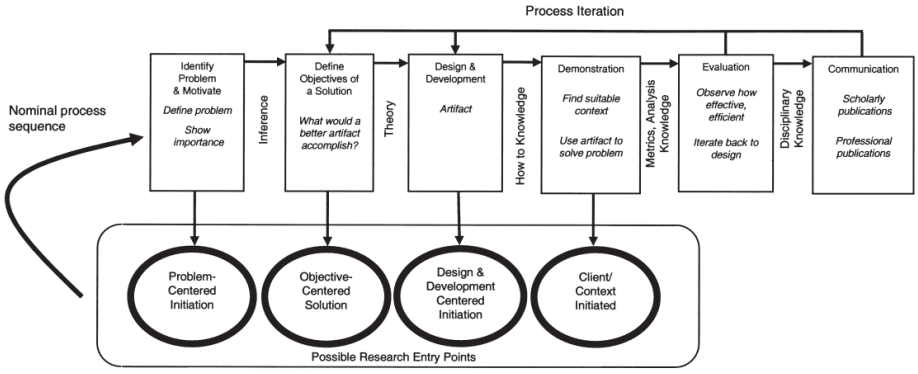

Fig. 1. The main phases of the Design Science Research Methodology [15].

5. *evaluation* − the goal of this step is to observe and measure how well the artifact supports a solution to the problem, comparing the objectives of a solution to actual observed results. The evaluation could take many forms, quantitative and qualitative (e.g., a comparison of the artifacts functionality with the solution objectives from step 2, objective performance measures, satisfaction surveys, client feedback, or simulations). At the end it is possible to decide whether to iterate back to step 3 (design and development) attempting to improve the effectiveness of the artifact or to leave further improvement to subsequent projects.
6. *communication* − at the end, it is suggested to communicate the carried out process and the obtained results to researchers and other relevant audiences.

As mentioned in the introduction, in this paper we focus on the first three steps, leaving the other three for subsequent work.

3 Step 1 - Problem identification and motivation

We discussed the problem in the introduction of the paper: *we want to improve the engagement of students in introductory courses in computer science*. It is somehow surprising that three of the most important introductory courses that we mentioned, i.e. Harvard CS50, Stanford CS101 and MIT 6.00 do not agree not only on the syllabus (that can be justified between MIT version and the others), but even on the programming language chosen.

4 Step 2 - Definition of the objectives for a solution

The aimed solution is a digital training platform, where beginner students can be encouraged to interact with, fostering the learning process of the specific programming language. In the next section, we provide more details about our

model. Our platform is based on `oii-web`, a platform developed for programming language contest training, where students are highly engaged: see, for example, the works of Dagienė [3] and Garcia-Mateos and Fernandez-Aleman [7].

5 Step 3 - Design and development

In this section we discuss the design of the platform; before providing the details, we briefly recall few aspects about Olympiads in Informatics and programming contents (Section 5.1), and available platforms (Section 5.2). Then we focus on the description of `oii-web` (Section 5.2), that is the platform on which we base our solution.

We refer the interested reader to the *Olympiads in Informatics* journal, that was founded in 2007, providing "*an international forum for presenting research and developments in the specific scope of teaching and learning informatics through olympiads and other competitions*". The classic book of Skiena [16] and the more recent of Halim and Halim [8] provide also essential material about algorithms, data structures, and heuristics needed in programming contests.

5.1 Olympiads in Informatics

As we mentioned in the introduction, the International Olympiads in Informatics started in Bulgaria in 1989, patronized by Unesco. Nowadays they are considered to be one of the most important programming competition in the world, with four contestants for each participating nation. The competition is divided in two competition days, with three tasks to complete in five hours. Each task is worth a certain amounts of points, usually 100 points. Since IOI 2010 each task is divided into subtasks, each worth a portion of the total points.

A graphical representation of a task, from OII 2014 final, is depicted in Fig. 2. The task, `taglialegna` (lumberjack), is the following: *there is a line of trees, with one meter of space between each of them. Each tree has a known height, in meters, and you can cut it aiming it toward its right or left. When an m meter tree falls, like in a domino game it forces the falling of its $m-1$ close trees, and this in turn can force other tree to fall. You can decide which tree to cut, and for each of them you can choose in which direction it will fall. What is the minimum number of trees to cut in order to remove all the trees in the line?*

There are several different solutions for this task. If we denote the number of trees with n, the computational complexity of the solutions ranges from a non trivial linear $O(n)$ to the brute force $O(n^3)$, and includes a $O(n \log n)$ and a $O(n^2)$ solution. The subtasks were designed to distinguish the above solutions.

Italy participates in IOI since 2000; promoted by a joint effort of MIUR (Ministry of Education, University and Research) and AICA (Italian Association for Informatics and Automatic Calculus, a non-profit organization), Italy started its national competition in 2001. The Italian Olympiads in Informatics (OII) are currently divided into three selections:

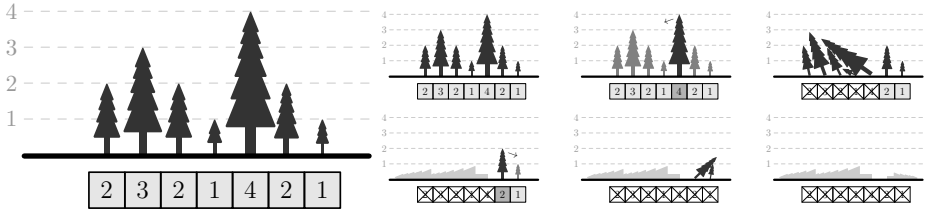

Fig. 2. The graphical representation of the task `taglialegna` (lumberjack), from OII 2014 final: an input instance (left) and a possible solution that uses two cuts (right).

1. **First Selection (Schools, November)**: in this phase, in their own schools, approximately 20k students competes to solve, on paper, a test that involves math, logic, and programming abilities; in particular, there are some fragments of code (C/C++ or Pascal), and the students are asked to understand the behavior of the fragments.
2. **Second Selection (Regions, April)**: in this phase there are approximately 40 venues, where approximately 1200 students, selected from the previous phase, compete by solving three programming tasks on the computer. In this phase points are awarded for solving the tasks, independently from the complexity of the solution.
3. **Third Selection (National Final, September)**: approximately 100 students are asked to solve *efficiently* three programming tasks on the computer. They compete for 5 gold, 10 silver and 20 bronze medals.

Thus, in the above selection process, students are asked to be able to *read* code, then to *write* code, and finally *efficiently write* code. A more detailed picture of the OII organization is described in [1].

After the national final it starts the IOI italian team selection: the gold and silver medal winners, together with at most five bronze medal winners, selected by (young) age, form the group of IOI-candidates, and four of them will represent Italy in the next IOI (usually held in July or August). Thus, there is almost one year to train and select them, and this process is mainly done in four stages held nearby Volterra. In each stage students face programming contests and theoretical lessons, ranging from traditional algorithms and data structures to competitive programming tips and tricks.

5.2 Programming Contests Platforms

There are several grading systems for programming contests: we mention the ones used in ACM International Collegiate Programming Contest (ICPC), i.e. the proprietary Kattis[7], and the open source PC[2], available at `http://pc2.ecs.csus.edu/`. Other open source grading systems are Open Judge System[8] and DOMjudge[9].

[7] `https://kth.kattis.com/`
[8] `https://github.com/NikolayIT/OpenJudgeSystem`
[9] `http://www.domjudge.org/`

Switching to online training platforms, amongst several high quality ones we cite the UVa Online Judge[10] and the more recent Sphere Online Judge[11] (SPOJ). There are several well known programming contests platforms, including Codeforces, USACO, COCI, TopCoder, Codechef, and Hackerearth, that run contests with different periodicity. There are also events based on programming contests, like the Google Code Jam and the Facebook Hacker Cup. We refer the interested reader to the work of Combéfis and Wautelet [2] for a detailed survey of programming contests.

5.3 The online training system: `oii-web`

As we mentioned before, `oii-web`[5, 6] is based on the *Contest Management System* (CMS) [9, 10], the grading system used in several programming competitions, including IOI. CMS was designed and coded almost exclusively by three developers involved in the Italian Olympiads in Informatics: Italy hosted IOI 2012 and therefore, since 2010, it started the development of CMS, that was used/tested in the OII finals 2011 and, few month later, was the grading system of IOI 2012. CMS version 1.0 was released in March 2013, and since then has been used in both IOI 2013 and 2014, together with several other programming competitions in the world [10].

Currently there are three active platforms, based on `oii-web`:

OII-training is the platform devoted to the students that are interested in OII. In this platform there are approximately 180 problems spanning several techniques and difficulties, ranging from regional contests to IOI level. Furthermore, there are also the tests, from the first selection of OII (schools selection), available as interactive online forms. So far we did not advertise this platform in the schools, since we consider it in a beta testing phase. We allowed students to register freely, and so far we have approximately 500 users despite the lack of promotion.

DIGIT is the platform dedicated to teachers: we realized this platform in a project sponsored by the MIUR, where the aim was to build a self-paced online course of computer programming, focused on the olympiads in informatics. The idea was to train the teachers so they would have been able to train their students. Thus, this platform is currently the richest of the three, in terms of contents and functionalities. There are video courses of C/C++ and Pascal programming, Algorithms and Data structures, and some basic video tutorial as well including how to use the platform to submit a solution. There are also some lecture notes, and all the material can be distributed to students as well; the video lectures are also available on the OII channel on youtube. The MIUR used this platform, since October 2013, in three distinct courses, with a fourth one scheduled to start in September 2015. So far approximately 2000 teachers followed this course, and the effects on the OII were impressive: the participation of students in OII preliminary stages raised from 13k to 21k.

[10] `https://uva.onlinejudge.org/`
[11] `http://www.spoj.com/`

IOI-candidates is the last platform, and the only one not publicly available, since it is devoted to the IOI-candidates. This platform, as we mentioned before, has been the original motivation to develop the whole `oii-web` system. This platform has all the problems available to the other two platform, together with a *reserved* set of problems that we use in the contests to rank the students. The students are asked not to discuss these problem in public forum or social network, since we usually reuse them after few years.

5.4 Our platform

We developed a customized version of `oii-web` able to accept python language. Students can use it without the need of a compiler installed on their computer. In order to use it it is enough to have a browser. Before releasing it and testing it with students, we plan to add some constraints to guide the students in the problems they can challenge: initially only few basic problems are available, and solving (even partially) each of them *unlocks* other problems.

The main features of our platform are:

- It is web based, i.e. in order to use it students need only a browser.
- It has an integrated IDE, similar to websites like www.ideone.com, that allows students to write their programs with an editor that support syntax highlighting.
- Students can also use their favorite IDE and or programming tools, since it is also possible to upload the source code.
- As in many programming contests, each problem to be solved has a number of instances against which the students code is tested. The students are awarded with points depending on the number of instances correctly solved within the time and space limits allowed.
- Students are provided with a report, for each instance, of the correctness of their code and a broad classification of errors found (e.g., segmentation fault or time limit exceeded).
- It has an integrated forum where students can exchange ideas and comment their solutions.
- It supports a badge system that allows a light gamification: students solving selected problems can be awarded with a dedicated badge.

6 Conclusions

In this paper we describe the beginning of a work in progress: the creation of a web based platform suited to provide more engagement to students of introductory computer science.

We followed a Design Science Research Methodology, and illustrated in the previous sections the first three steps, thus reaching the design and development step of our work.

We plan to conclude this work, and in particular the three missing steps of the DSRM, by testing the platform in a real university introductory computer science course, to students of a Business school.

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Riding Social Media Buzz: How Online Reviews Affect Purchase And Adoption Of Video Games

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Abstract. This paper looks through the keyhole of the video game industry by using online reviews as a vehicle to investigate about product sales. Video games players tend to gather in online communities where they actively participate in discussions, beta testing, helping each other in problem solving. These Internet experienced users provide valuable buzz noise that can be used to testify purchase and adoption of game titles. We built a database of more than half a million online reviews of video games sold in 2015, from leading social media websites, we then analyzed users' ratings and we finally verified the relationship between this buzz and product sales and adoption. Our findings say that there is a positive correlation between the volume of online reviews and the worldwide units sold. Moreover, our research has shown that also negative online reviews increase the units sold, giving one more time the proof of the importance of the social media buzz to video game publishers. We believe these findings help companies in designing marketing campaigns by accurately allocating spending between different channels.

Keywords: *Video Game Industry, Awareness Effect, Word-of-Mouth, Social Pressure*

1 Introduction

Perhaps, no greater testament to the power of influence in modern sale strategy exists than the video game industry, one of the most prosperous businesses in the digital landscape. For a number of reasons, gamers manifested a consistent willingness to pay over the past decade, even though the wide scale advent of the Internet caused many businesses to migrate to a free or "freemium" business model. Moreover, competition occurred by offering to clients more and more powerful hardware consoles, for relatively low prices, being the Trojan horse to lure customers with expensive and super entertaining game titles.

Global video games revenues are supposed to reach by 2018 the $100 billion threshold according to Gartner Forecast and the Newzoo's 2014 Global Games

Market Report, and they are rapidly approaching to that goal. The success of some blockbuster titles such as Assassin's Creed, Call of Duty or GTA casts its shadow even over some of the most praised blockbusters in the movie industry. In 2013 when GTA V was launched it earned $800 million only in the first 24 hours, and within three days it had already run over $1 billion [1] making it the fast-selling entertainment product ever, a remarkable success if one considers that to reach the same sale figures it took 17 days to the movie Avatar and 12 days to the most recent success of Star Wars: The Force Awakens.

It is not surprising then that this industry has ascended to a prominent role in the today Media & Entertainment sector: in a global economy that has spent rough years of crisis, people were gladly willing to spend money with video games of different sort. An evidence of that is the increased number of players every year, in 2015 the Entertainment Software Association reported that in more than a half of U.S. houses there was at least one video game console and that 42% of American population play video games on a regular basis, which is at least three hours per week [2].

This extraordinary result has also been helped by the fact that the latest generation of home consoles (XBOX ONE, PlayStation 4 and Wii U) did all come out between 2012 and 2013 and their prices have decreased considerably during the year. This has allowed more and more people to switch to the latest consoles if they already had one of the old ones, or to buy a brand new if they were not already gamers, thus leading to the impressive amount of 68.1 million consoles of 8th generation now on the market, 139.2 million if one includes also portable devices (Nintendo 3DS and PlayStation Vita) [3].

Since appetite comes with eating, game publishing houses pushed competition even further, and discovered that their target customers are heavy users of Internet resources. Thus, the combination of user generated content with rating fever, hit the video game industry: today online communities act as real powerhouses capable of influencing clients in their purchasing behaviors.

Word of mouth is a phenomenon that advertisement and economics' experts have been studying for decades from different perspectives to understand all the effects that it may have on sales, brand awareness and success of a new product launch [4, 5, 6, 7, 8, 9]. The main purpose of these studies was, from a marketing point of view, to understand how product reviews coming from different sources affected buying decisions and if corporate organizations had any chance to affect those channels as they do with other forms of advertisement [10]. Now the competitive landscape is crowded with online communities, another place where word of mouth spreads and inseminates both potential and existing customers.

In this paper we investigate the relationship between these online communities and video game sales. We argue that these communities host a new category of influencers: community members. They became, by all means, social actors that exercise and suffer social pressure.

2 Social pressure and word of mouth: a two sided coin issue

2.1. Social Pressure

Social pressure or social influence is defined as the situation when people's emotions, opinions, or behaviors are affected by others [11]. Such pressure is triggered by individuals' need of both being appreciated and right; people feel that conforming to others' expectation is the only way to satisfy the previously mentioned necessities [12]. In a similar fashion to what happens for human beings, also institutions and organizations are not immune from that mechanism; influence verifies at organizational level both internally, within the hierarchy [13], and externally, among other organizations [14]. Social networks and blogs where users freely post their contribution become part of this mosaic: in fact, as their diffusion rate gets pretty high and the large majority of organizations and famous people join such communities, also other "peers" are forced to do it in order to fulfill their desire of being appreciated and feeling right. We define "social media pressure" the influence exerted over institutions in adopting and using a given social media platform, with all the consequences that such issue brings. Applying this important concept to online blogs and game review platforms, we easily see how the social pressure mechanism, in this field, is bidirectional: from one side, people are stimulated to contribute with content, this content, in turn, exerts a social pressure to other users and community members to do the same in order to be accepted and appreciated by the community.

2.2. Word Of Mouth

Word of Mouth (WOM) is a phenomenon that triggered the interest among researchers of various disciplines, like sociology, economics, and marketing [4], [15, 16]; one of the most relevant and studied research questions regards the impacts that WOM has in decision-making processes. WOM was commonly defined as an oral and informal information flow among two or more subjects, which can range from very a simple conversation, like telling someone the time of day, to more complex and articulated product evaluations [17] WOM phenomenon usually happens in private conversations due to its informal nature, therefore it is not possible to analyze such issue through secondary data [4]. Online user reviews turned out to be relevant information sources for consumers, both substituting and complementing the more traditional offline word-of-mouth communication, as it was previously defined [18].

Due to the fact that addressing the issue of how WOM impacts products' sales, it is necessary to research on alternative methods to open such black box. Still, although previous literature failed to accurately measure the magnitude of the previously mentioned effect, it is largely recognized the key role played by WOM in modifying consumers' purchase behavior, so for corporations it is vital to carefully take into account the phenomenon when they design marketing strategies [19]. Some research techniques used by the literature to research on the WOM phenomenon include the study of online conversations [20], movies [6], online consumer reviews [21]. Regarding this last research article, the author points out that "online consumer review, a type of product information created by users based on personal usage

experience, can serve as a new element in the marketing communications mix and work as free sales assistants to help consumers identify the products that best match their idiosyncratic usage conditions." Such statement highlights the relevance on producing further research material on WOM effect in online reviews, due to its strategic interest both for practitioners and scholars. Furthermore, [20], claim that WOM is responsible for people homologation to other peers' choices, and it is more likely that users replicate what many others have already done even if that may not be the real individually preferred choice [20]. All these insights remark the (social) pressure that WOM exerts on consumers' decision-making, in peculiar theoretical mechanism: online reviews pushes other authors to produce more reviews according to the social pressure scheme; then, those reviews as a whole, influence the market. The fact that online reviews trigger the release of more reviews in an iterative fashion implies, de facto, that the powerfulness of each single review is much stronger than what may appears at first sight. The discovery of [20], i.e. that new reviewers are more likely to evaluate products consistently with previous reviews, enhance even more the relevance level of every single review. This mechanism highlights the presence of a bandwagon effect of on-line reviews, where the first ones in chronological order counts much more.

As previously mentioned, before the beginning of the telecommunication era, WOM was purely oral and its diffusion pattern follows a typical organic-epidemic-like path because, exactly as it happens with viruses, for transferring it needs a direct contact among people [8]. With the advent of Internet, WOM went beyond the oral boundary and gained a lot of more power: by using the world wide web, users' comments can spread much faster, so the effects are amplified in magnitude and faster in diffusion.

Finally, WOM is often considered as only the antecedent of products' sales, but we claim it is not. In fact, they have actually a mutual affection on each other. While it appears immediately clear how word of mouth influences people's choices and can lead to a direct increase/decrease in products' sale, it cannot be ignored the fact that also the volumes of sales affect the volumes of consequent word of mouth; in other words, the more products have been sold today the more people will talk about this product tomorrow, for the same social pressure mechanism previously explained. Figure 1 summarizes this discussion.

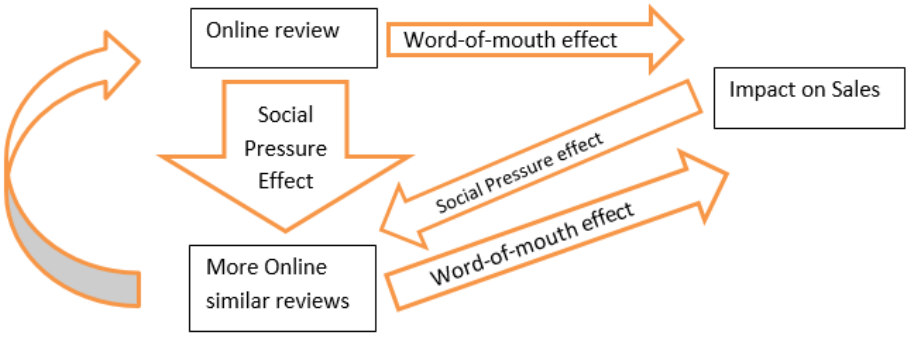

Fig. 1. The existing relationship between Online reviews and Sales.

2.3. Online Reviews and E-Wom

Starting from the nineties, thanks to the constant growing internet penetration, a new way of sharing experiences on products has born. More in general, various IT artefacts like social networks, blogs, forums, allowed new forms of communication and knowledge sharing that only 30 years ago were unimaginable experiences. Nowadays a countless variety of websites, forums, blogs, vlogs, social media pages, invade the web; users can share opinions and other many kinds of information about very heterogeneous topics. Online reviews, in this setting, clearly represent a powerful form of eWOM, and it represents a valid proxy to study the word of mouth phenomenon. The powerfulness of online reviews as a eWOM tool is confirmed by the relevance attributed by company owners to comments on Tripadvisor, Booking.com, and others [22, 23].

Also online marketplaces like Amazon or eBay embed "users' reviews" section below each product they sell so that potential users can read comments from people who have already finalized a purchase. Now, while traditional word of mouth reflects the opinion given by trusted people, such online reviews are written by users not personally known in most of the cases, therefore the trustworthiness issue gets relevant.

According to [10] about 80% of the users declared to trust online reviews, therefore the reliability of eWOM nowadays does not differ so much from the traditional WOM; with the big differences in terms of spreading velocity discussed before.

There is a trend to post comments on a certain product only when your experience about it is either very good or very bad [24]. For this reason, in many cases, reviews themselves are biased and it is more likely to find only extremely negative or extremely positive posts, which attract, in turn, more negative or positive reviews for the iterative mechanism triggered by social pressure.

This effect depends on the fact that in the majority of the situations people are not willing to express their opinion because it is a mild one. They are not enough satisfied with a product to register only to strongly suggest it to other people nor are so disappointed to decide to do so for preventing others from doing the same mistakes.

For communities, this reasoning applies in a less relevant way, in fact the sense of belonging pushes users to contribute with content in any case. As it happens with traditional communities that gather around a common interest, also internet communities are nowadays a reality [8].

Online communities usually embed hundreds or even thousands of members, who actively participate to the community life by sharing comments and contributing in many ways. While topics might be very heterogeneous, the common trait of all communities is that members feel part of a group, which in most case is seen as an extension of their own family [25].

In those groups repeated interactions are likely to generate a sense of trust among members [26] and therefore they listen to each other's opinions and actively share knowledge creating a common knowledge that goes beyond the traditional browsing reviews before buying a new vacuum cleaner. Companies that understand the benefits that a prospering community can bring to its own products and brand image, invest a lot in creating stimulating and active communities where knowledge is not only share but also a learning process is involved [27]. The advantage of eWOM allows in fact the company to receive precious feedbacks that with traditional ways of advertising were once precluded, and can also take advantage of such a loyal customer base to innovate and stimulate creativity.

According to the lead user stream of literature [28], customers that actually deeply care about a specific product or service are also more likely to know those products/services better than the average customer's knowledge, and could therefore act as lead users or influencers, bringing new ideas and anticipating customers' future needs. But, when a website or a blog is controlled by a firm, customers might perceive a lack of objectivity, de facto lowering the trustworthiness level of reviews contained in such platform. Having an independent and free space where sharing reviews and opinions attracts much more users, since there is nowadays so much information around, in order to find what they need, people have become more picky. Still in such a free environment there is no way of preventing companies' employees from creating fake accounts to idolize their products or, on the other hand, cast a bad light over competitors' ones. Said so it is however fair to assume that since there are often thousands or tens of thousands of different reviews on the net, the volumes themselves could prevent those "piloted reviews" from having any effect [29].

3 Hypotheses statement and Methodology

Consistently with the theoretical setting and the discussion carried out in the previous chapter, we expect that, in a similar way to what happens in the movie industry [6], the volume of reviews positively affects sales, because of the awareness effect online reviews and word of mouth have:

- *H1: The more are the users' reviews posted in online blogs related to a specific game title, the more are the worldwide units sold of the same title.*

Then, we expect that negative user reviews can trigger curiosity among community members. This interesting effect might lead to the apparently counterintuitive positive

impact of negative reviews' ratings on video games' sales. Such mechanism could have also intriguing effect on the study field on eWOM:

- *H2: Negative online reviews, on average, increase the worldwide units sold of the same title.*

In order to provide empirical verification to the previously mentioned theoretical statements, we collected data from three different sources, which are ones of the most popular online blogs for gamers: IGN Entertainment[1], Gamespot[2], and Metacritic[3]. We did not include other popular blogs that provide reviews also for the hardware component, in addition to the software one, such as Neo-Seeker. This decision was mainly due to our willingness of focusing attention on gamers rather than experts of electronic components.

The three previously mentioned online platforms are considered the best review aggregators and community spaces in the Entertainment sector and in particular for the video games industry. According to the Alexa Rating that collects internet traffic analytics, these websites in 2014 held respectively the 334th, 838th and 1505th positions in the worldwide ranking of most visited websites and that is why they are held in such a high consideration from all the industry experts to the point that even publishers use them as KPIs to evaluate their performances.

If reviews were collected from the website mentioned above, all the figures regarding sales of video games and consoles were collected from VGChartz's database, a website dedicated only to video games that provide up to date information and statistics on retail sales for all the video games and game consoles in the world. Besides sales figures and general information like genre or publishing house, their database provides also additional information such as detailed sales for the first 10 weeks from the launch of a video game title or sales aggregated for geographical area (e.g. U.S., South America, Japan, Africa, etc.).

[1] IGN has been founded in mid-90s. It quickly made a name among media & entertainment fans and experts for its focus on movies, video games, TV programmes, comic books and technology latest news. Over the years its influence has grown even more and during its expansion it bought several other platforms with very specific competences such as RottenTomatoes for movie reviews or GameStats and GameSpy for video gamers, thus becoming almost an institution of the sector.

[2] Gamespot, with almost two decades of history, has its main focus on video games and it has won several prizes over the year as "Best video game website". Attracting more than 50 million visitors every year, not only does it collect reviews and news for all the video games titles, but it also provides useful information for users to search games they might like.

[3] Metacritic has been founded in 1999. This website is considered the best one as far as reviews are concerned. In a different way from any other website providing reviews of movies, book, TV shows, video games and of any media products, Metacritic has made reviews its main focus. Due to the attention they pay on creating a significant weighted average score for games, they are held in high consideration in the industry and many important newspapers such as The Wall Street Journal or The Guardian, have recognized the impact that their reviews and scores have on the industry sales.

For the sake of this paper, the 2015 top 100 chart have been extrapolated from VGChartz in order to have a significant amount of reviews available to investigate potential effects on sales. We deliberately limited our study to the last full year available (2015) to avoid the overlap of reviews referring to different years. Consequently, all titles that were released in 2014 but whose sales were still high enough to make them appear in the ranking have been removed from the database, because the majority of the reviews regarding those video games referred to a different period and were not consistent with 2015 sales. By doing this we obtained a cleaned dataset with comparable data points: sales and reviews of the same year. The focus of this analysis will be only home console video games, therefore all titles conceived for handheld devices such as Nintendo DS3 or for PC have been removed. This has left to a sample of 56 video top selling video game titles that have been further aggregated in order to avoid duplication in the analysis, because some titles occurred more than once for different console platforms (for instance Call of Duty: Black Ops 3 was in the top 100 for all its versions, from Xbox 360 to PS4).

To make all the data homogenous all the reviews' scores, both the ones coming from users and the ones from critics have been homogenized to a 0-10 range span. For all those reviews, like many critic ones, that had not a numerical value attached to the reviews, we have adopted a sentiment analysis methodology. Sentiment analysis is a common method for analyzing huge amounts of text data, from reviews to social media conversations, in order to turn those words into a sentiment value that marketers can use, for instance, to know how a brand or a product is perceived across social media [30]. Since in our analysis we did not need to browse conversations looking for specific brand names, but we just had to convert each review's text into its sentiment value, we relied on a library named AFINN and developed by professor Finn Årup Nielsen, an expert in data mining and social media at the Copenaghen's Technical University of Denmark. By incorporating this library, we have been able to attach to each review a numerical value ranging from -5 for very negative texts to +5 for very positive ones, values that have been then normalized to the 0-10 range in order to be comparable with all the other reviews' scores. In order to investigate the impact that reviews have over sales we have analyzed the data with a linear regression $Yi = \beta 0+\beta 1Xi1+\beta 2Xi2+\beta n+Xin +\acute{\epsilon}i$, with i being the ith video game of our sample dataset. More precisely, the equation works in this way: as dependent variable (Y), we have used the units sold figures collected from VGChartz, while as independent variables we have the volume of reviews (X) for each video game title (i), the average rating of user reviews and the average rating of critic reviews (β) as main variables whose effect we wanted to investigate. We have then added other controls, in order to refine the analysis and increase statistical significance of the results. Controls include dummy variables that measure whether a certain video game was part of a franchise, whether it was published by one of the major video game publishing houses or if it was released on multiple platforms, all factors that could amplify the resonance of the WOM for that game. Also the average price of the video game during its lifetime, collected from Amazon, was included in the analysis to understand if it affects the sales in some way.

4 Results

Table 2 presents a summary of the descriptive statistics used for our analysis.

Table 1. Overview of descriptive statistics.

Variable	Description	Mean	Median	Std Dev	Min	Max
Units sold	Number of units sold for each game globally (express in thousands)	3674,21	2517,34	3677,14	1015,10	19663,82
Volume of reviews	Number of user reviews collected from IGN, GameSpot and Metacritic	14540	9444	13747	40	58673
User rating	Average rating of reviews from users as listed on IGN, GameSpot and Metacritic	7,02	7,10	1,25	4,07	8,82
Critic rating	Average rating of reviews from critics as listed on IGN, GameSpot and Metacritic	7,93	8,00	0,82	6,30	9,84
Price	Average price ($) on Amazon during the lifetime of the	41,90	45,00	8,94	19,99	59,00
Franchise	Dummy variable if the game is a sequel or part of a	0,77	1	0,43	0	1
Major Publisher	Dummy variable if the game has been published by one of the main video game publishing houses (EA, Activision, Sony, Nintendo, Ubisoft and Microsoft)	0,56	1	0,50	0	1
PS4	If the game has been made available for PS4	0,79	1	0,41	0	1
PS3	If the game has been made available for PS3	0,33	0	0,48	0	1
XONE	If the game has been made available for XONE	0,77	1	0,43	0	1
X360	If the game has been made available for X360	0,33	0	0,48	0	1
WIIU	If the game has been made available for WIIU	0,15	0	0,37	0	1
WII	If the game has been made available for WII	0,03	0	0,16	0	1
Multi-platform	If the game has been made available for more than one home console	0,72	1	0,46	0	1

We considered the top 100 of 2015 games, removing from the dataset all those games who were not released in 2015 and those who were not made for home consoles. Thus our sample was made of 56 video games that were further aggregated because some of them were the same video game. We finally narrowed down the analysis to 39 cases.

Those top 39 video games titles managed to sell in 2015 143,3 million copies worldwide, generating revenues for nearly $6,5 billion; it's also important to notice that half of them where released only in the last quarter of the year, with some like Fallout 4 or Call of Duty: Black Ops 3 that were released in November and in less of 2 months managed to reach respectively the fourth and the first positions of the rank. In addition to the sales results, those titles generated also a very high amount of reviews, in the number of 567.047 reviews from the three source websites considered. Moreover, descriptive statistics say that the best performing games sell on average 3,7 million copies at an average price of €41,70, generating on average 14540 reviews on the major video game communities.

We also included a dummy variable to measure whether one of those game titles, in the 100 top selling chart, were manufactured by a major publisher or not. This was considered relevant because publishing houses such as EA, Activision or Sony, not only have usually more financial resources to invest on marketing campaigns thus raising more interest around a game title and generating WOM, but they usually have

a more loyal customer base. As we can see from table 2, the major houses publish only 56% of the top selling video games.

Another dummy variable that was included in the analysis was whether the game was part of a franchise, even being a sequel, a reboot or a spinoff of an already existing past title. In this case the results are far less surprising, as we can see from the table 77% of the top selling games from last year were part of a franchise. This one more time brings evidence to the success that sequels have in the movie and video game industries, with each title performing better that the previous one. There is also no surprise in the results coming from the last line of table 2, with 72% of the sample being released on more than a home console platform. Nowadays, with rare exceptions, games are usually produced and made available for at least two consoles at a time. The exception are usually for games made ad hoc by Sony, Nintendo and Microsoft for their consoles. For example, Nintendo releases the majority of the titles only for the WIIU, or Microsoft releases Halo exclusively for the XOne.

We created a multivariate linear equation to analyze the impact of video games reviews over their sales, applying the following equation

$$Yi = \beta 0+\beta 1Xi1+\beta 2Xi2+\beta n+Xin +\acute{\epsilon}i.$$

In the equation i is the ith video game of our sample dataset, Y, the dependent variable, is the units of a video games sold, while the rest of the variable from table 2 are our independent variables. The results of our regressions, assuming a level of significance of 0,05, have been summarized in the following table 3. As we can see from the regression statistics the Multiple R and the R-square are quite high, therefore the model can be considered good as it manages to capture a quite high percentage of the overall variance.

Table 2. Regression results. **=significant at .05 level

Regression statistics	
Multiple R	0,84669752
R-square	0,716896691
Adjusted R-square	0,569682971
Standard error	2412,15004

	Coefficients	*Standard error*	*Stat t*
Intercept	521,5143391	5956,661022	0,087551455
Volume of reviews	**0,104380669****	0,037775048	2,763217385
User rating	**-1554,660833****	473,8624938	-3,280826934
Critic rating	611,4134412	660,2749991	0,92599817
Price	**130,8848818****	53,22580182	2,459049508
Franchise	2022,034109	1290,059406	1,567396121
Major Publisher	-279,7207212	1244,836809	-0,224704732
PS4	2049,123935	1759,775541	1,164423466

PS3	-19,39381669	2191,253631	-0,008850558
XONE	-1189,268284	1825,769762	-0,651379111
X360	942,0139577	2075,716326	0,453825962
WIIU	1141,742809	1508,981087	0,756631623
WII	1039,767756	3025,736297	0,343641234
Multi-platform	-566,6236619	2024,361859	-0,27990236

We wanted to investigate if there is a correlation between the volume of reviews and the sales of the related videogames, and at the same time if there is correlation between users' review and sales. We observe that the "Volume of review" coefficient is positive and significant, therefore the first hypothesis is confirmed. For the variable user rating we can see that the related coefficient is negative and significant, as a consequence we empirically verified that negative reviews, on average, increase the units sold of a specific game. This leads us to the important implication according with the volume of reviews really matters. Such consideration brings nontrivial consequences for practitioners, in particular marketing departments of game manufacturers, which will be widely analyzed in the last chapter of this paper.

5 Further Research and Limitations

Even if the results from our analysis are consistent with previous literature, there are however some limitations that must be mentioned.

The first limitation derives from the source of reviews we have chosen for our study. We have selected the three major worldwide websites on video games with the assumption that nowadays they can be accessible from anywhere in the world and that English is recognized as the main communication language. Further investigation is needed to look into language specific reviews / social media communities: for example, due to the growth of the Chinese market even in this industry, this is an aspect may be interesting to consider for further research. Beside the language issue, there are many other places on the net such as blogs, chat rooms, and so on where gamers can gather and discuss about games, some of which are also private and thus impossible to measure. Filtering online reviews by geography could do other further studies.

Another limitation in the analysis is given by the size of the sample, unfortunately free accessible databases on the industry provide detailed data only for the top 100 video games available on the market and so it was impossible to collect enough information on less successful products to investigate whether reviews had an impact on them too.

We have limited our attention only to home consoles video games, but the video games market is far bigger, and some other categories might be explored as well. There is still space for future research on the mobile gaming industry, which is the one growing at the highest rate at the moment. Since those games usually have all the comments listed below the products themselves in the marketplace (either App Store

or Play Store), it may be interesting to investigate whether the results of this study stand true also in that market.

Finally, we would like to make a consideration on the database we have used to collect our data about video games sales [3], which provides information only about video games sold through the retailing channel. At the moment we are writing there are no available data on the digital distribution copies that companies sell for their consoles through their online marketplace because companies have not yet decided to disclose those figures. However, if in the future such data would appear, it may become interesting and meaningful studying how online reviews affect digital sales, because in such an environment those online distribution platforms will become probably more similar to mobile stores than to traditional video game online communities.

6 Conclusions

Our objective in this paper was to investigate the impact that online reviews had on the success of video games titles, since analogue investigations in the movie industry reached similar conclusions. For over two decades online reviews and their impact over products' sales have been studied together with digital word of mouth because of the increasing number of customers who declared of relying on them for purchasing choices, up to the 80% of customers in most recent times [19].

Industry players consider it as a crucial aspect and have invested a lot of their marketing efforts and resources on understanding how word of mouth and online reviews affect their profits. This is especially true in industries, like media, that produce experience goods whose qualities are impossible to evaluate prior to use [4, 5], [8, 9].

WOM and eWOM play an important signaling role in this market, becoming a complement to marketing budgets and expenses needed to launch and sustain a title in the competitive arena. Then the trade-off becomes: how much money should firms spend on advertising versus money needed to spread eWOM (and traditional WOM too)? Since advertising campaigns are always perceived as handcrafted by companies to sell more, in the case of experience goods clients will trust more suggestions and opinions coming from friends, colleagues or, when they are not available, other consumers who had shared their thoughts online and tested the products for them.

Needless to say that the advent of the Internet has boosted this word of mouth or buzz phenomenon, making in some ways more difficult to keep track of the thousands of websites, blogs, forums, social networks, and so on, where people share their opinions and thoughts about products. On the other side of the coin, this entire buzz leaves traces online, making it a very interesting research platform to infer about the overall product sales. Even if online reviews and comments are not exhaustive of all the conversations and eWOM that occur in the Internet, due to the fact that many conversations are private, they still have allowed to make huge steps forward in the study of this phenomenon, to better understand its impacts and how it can be used to companies' benefit.

The majority of the best-selling video game titles (77%) are either sequels of spin-offs of already existing franchising. This may not come as a surprise if we think at the incredible success of franchises like Assassin's Creed or Call of Duty, however this arises an issue with respect to online reviews' creation. Since these games come from already well known franchises and publishing houses, gamers start posting online reviews on them fair in advance to their launch, discussing their expectations, commenting trailers or beta-versions that firms have released, and so on. This may create a distortion in the data that are not reflecting actual quality or experience about the games, because reviewers have not yet had the chance to buy and test them, but only expectations and often negative critics. A good example is what happens before every new FIFA's game when gamers "loyal" to PES start criticizing it just for play.

This phenomenon of anticipation frenzy is something not unusual also in other industries like movies, books or hi-tech, when prior to the launch of a new iPhone or a new Star Wars movie a lot of people pre-order them and start creating thousands of online threads of discussion basically without any knowledge of the product itself but just discussing their expectations or feelings about it and thus raising awareness of the product

In the video game industry the play is the same: a vast community of tech – experienced people, that meet online, chat online, interact online, continue their gaming experience online, manufacture a gargantuan buzz on their favorite title. If such anticipation is typical of those games that are part of a franchise, it is also true that companies have a lot of power in raising interest over a certain video game in advance, but they seldom use it properly. Starting early with the creation of this online buzz, they will obtain greater benefits from word of mouth's diffusion, thus amplifying the resonance (and success) of that product's launch. If from our empirical results we have seen that our first hypothesis about the positive impact of the volume of reviews over games' sales was correct, we have also found out that this was not the case for our second hypothesis, the correlation between the actual users' ratings and the products' success. User reviews and sales appear to have in fact a negative correlation, and this would contradict our initial assumption that in online gaming communities the sense of trust is higher and users consider other community's members reviews more trustworthy than what happens for instance in the movie industry.

Even if that is the case, and on average a user's rating score of the top selling video games is of 7, we must consider that the top selling games are also the ones with the highest number of reviews, therefore there is much more discussion about those games and consequently more diatribes too. This result is consistent with similar findings in the movie industry [6] where it was found that only the volume was significant in forecasting movies' success, proving that movie industries and video games industries are very alike as far as reviews are concerned.

Considering that customers seems to be affected only by the volumes of the online reviews of a certain game disregarding the scores associated to them, video game publishers should invest more in raising anticipation and creating occasions to talk about a video game rather than trying to influence the audience in order to obtain a better score.

Usually there is a lot of talk about companies publishing positive reviews of their products or negative reviews of their competitors' ones in order to improve their image and thus their sales, but this does not seem like an effective strategy to pursue, at least in this industry. If it is true that in this environment the score is irrelevant or may even lead to perceive those reviews as fake, it does not matter if a video game title has a score of 6 or 9, but it would instead make a huge difference having 5000 comments on the website instead that 80.

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Co-creation value in the sport events management process: The role of technology

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Abstract. This paper investigates the application of new technologies, especially social media, in the sport events management process by adopting the value co-creation perspective. Specifically, we aim to evidence how, by adopting the co-creation value concept, the sport events management process could be successful thanks to the support of technology mainly considering an active role of consumers in giving feedbacks, opinions, suggestions, and criticisms about the same sport events. Technology, mostly information technology (IT) and internet, that deeply changed the social and economic activities, has been more and more applied in different areas in the sport sector, mostly in the sport events sub-field. On one side, new technologies facilitate the knowledge transfer in the sporting event management process, such as the Olympic Games; on the other side, the innovative techniques can affect significantly the communication and cooperative process between partners involved, especially in the interactions between private and public partners in the perspective of co-creation value thanks to their collaboration. This theoretical study, conducted through a review of the literature, represents a research starting point that allows us to systematize and clarify the existing contributions on sports events and co-creation value expressed thanks to the adoption of new technologies and to identify new research perspectives. This paper provides interesting theoretical and managerial implications.

Keywords: technology, co-creation value, sport events, social media, service-dominant logic (SDL), event management process.

1 Introduction

Co-creation has been conceived as an interesting concept by developing itself as a new paradigm in the management literature by allowing the organizations and customers to create value through their interactions [1, 2, 3, 4]. Since the early 2000s, co-creation has swiftly spread through theoretical frameworks and empirical analyses, by challenging some of the most important pillars of the capitalist economies. In these economies, the concept of value is usually fixed before there is the market exchange [1, 5, 6, 7].

According to the co-creation perspective, suppliers and customers are, conversely, no longer on opposite sides, but they tend to interact with each other for developing new business opportunities [1, 2, 3].

Co-creation can be defined as the added value providing from the collaboration between organizations and customers, both materially and symbolically [1, 2, 3]. It is a form of market or business strategy that emphasizes the generation and implementation of a corporate value shared with the customers, specifically, and with all the partners involved, in general. In this paper, we consider the co-creation as a more general concept which includes all the specific aspects able to push businesses and customers to generate value through interactions [8].

The phenomenon of co-creation is seen as a phenomenon of significant change in the corporate culture, that is it is a way to share ideas with the different stakeholders, to open the business world to the consumer world and to understand what the real needs are. The current consumer is an independent individual, for instance, the participant or visitor of sport events, with an orientation towards change or open to change orientation, often by looking for a dialogue on equal terms with the organization and the latter requires a greater engagement, thus as to fill the gap that separates them in the past. As a result, the organizations must pay attention to the new and changing consumers' needs and should try to satisfy them. In this dynamic and complex scenario, briefly described, it is necessary to recognize the central role played by new technologies, particularly the digital world (social media, web 2.0) in facilitating communication and cooperative processes between consumers and organizations promoting and making accessible to a broad audience the co-creation activities.

The practice of co-creation does not consists completely into a new business. In the last years, we observe a growing attention paid by academics and practitioners with a spread of academic collaborations, in particular in the field of research and development (R&D), to increase the organization value and to create new projects. Subsequently, until the '90s, other instruments were used: focus group, feedbacks required from selected groups of consumers, outsourcing to further engage customers in new business projects, and so forth.

Nowadays, thanks to the use of more interactive and diversified communication channels and tools, the organizations are getting more and more very close and frequent interactions with the customers, by receiving relevant support by the customers making them the central player: an example of co-creation is the use of user-generated content (user generated content). The active contribution for the organization derives by people who voluntary participate, perhaps because they are fans of a specific brand, to increase the value and the emotional bond with the company. Therefore, organizations have to attract and engage users, that is customers, relying on their emotional engagement, but also on their artistic and creative skills.

However, the co-creation of products, services, media content, promotional events, commercials, is now considered by scholars and practitioners the most promising driver to innovation, competitiveness and an improved supply-demand system. In this direction, users actively collaborate with manufacturers in the design, implementation, use and even promotion of co-created products or services.

In this study, we aim to investigate the influence of technology, in particular, the digital media, mainly adopting social networks, for planning and managing sports events through the involvement and participation of customers, that is specifically passive participants or visitors. In the recent years, sport events have been receiving an increasing attention and they are held everywhere in the world, thanks to media such as television and internet. Of course, although sport events present a deep message related to the diffusion of equality and social values through sport activities, they aim to generate positive economic results, that is profit, above all for the event organizers and all the players involved, directly and indirectly, in the complex and wide planning and managerial process.

Generally, events represent a communication lever for making the "direct" contact with internal public, consumers or spectators, in an innovative way without intermediaries, with reference to the overall world with a specific brand or a promoter. The level of complexity of the context related to the sports world has a strong impact on the achievement of its own products/services that are an expression of multiple subjects. Design, production, distribution and communication of sports content involve numerous actors, who participate in realizing the sport with diversified roles and importance: sport organizations, athletes, local institutions and governments, sponsors, media, fans and supporters, sport event organizers, are obviously central for providing sport events services. However, the passion, the excitement, the audience expressed, the involvement play a key role in the implementation of a sporting event and, therefore, the co-creation of value, involving all the players, public and private actors. In this frame, the adoption of new technologies, especially new media, can have a significant positive impact making sport events successful because they widely facilitate the interactions between the players involved, mainly the sport event organizers and customers.

This paper is structured as follows: the section 2 briefly describes the co-creation value concept with focus on Service Dominant Logic (SDL) evidencing the main contributions on this issue in the literature. In the section 3 the focus is on the specific application area of sport events and new technologies, also describing the main related challenges in the perspective of co-creation value concept. Finally, in the section 5 some final considerations are provided about the phenomenon investigated.

2 Co-creation value and *Service Dominant Logic* (SDL)

Co-creation is the joint, collaborative, concurrent, peer-like process of providing new value, both materially and symbolically. There is an ongoing debate in the literature about the differences between co-creation and co-production and the need to distinguish between them [9, 10]. In this paper, we consider co-creation as a more general concept that encompasses all the specific theoretical and empirical occurrences in which organizations and customers generate value through interactions [8].

Prahalad and Ramaswamy [5] introduce co-creation by acknowledging the changing roles in the theatre of the market: Customers and suppliers interact and

largely collaborate beyond the price system that traditionally mediates supply-demand relationships. They consider consumer and business markets, as well as downward (customers) and upward (suppliers) relationships. Later, Prahalad and Ramaswamy [1, 6, 11] problematized and articulated the various directions in which co-creation could and should provide benefits for organizations and customers, such as improving consumption and usage experiences [12, 13] and stimulating product and service innovation [14, 15].

From the service science perspective, Vargo and Lusch [7] suggest that organizations should not focus on products, but should just consider their offerings in terms of the services they can offer to the customers. Co-creation is one of the constitutive elements of this theory: it is through customer collaboration that the market offering is realized and the required benefits (activities and services) are generated.

More generally, according to the literature, co-creation is inherent to service businesses in which market offerings (quantity, quality, attributes) are actually created in the service encounter [16, 17]. Recent developments in the service theory are grounded in the co-creation debate and converge in this direction; they claim that the service offered from organizations can be understood as "the application of specialist skills (knowledge or skills) through actions, processes or services in favor of another entity or the entity itself" [7, 18: 407], which implies recognizing the value of the service collaboratively produced through forms and ties of interactions between the service systems oriented to mutual exchange and benefits. These systems are characterized by a network and/or own resources constellation, made available and integrated with each other [19] and they clearly contribute to the co-creation of value.

In general, the study of service systems and methods of co-creation of value within the scope of the Service Science can be briefly systematized and read thanks to the study conducted by Ostrom and colleagues [20: 5], who define the phenomenon "as an emerging interdisciplinary field of inquiry that focuses on fundamental science, models, theories, and applications to drive service innovation, competition, and wellbeing through co-creation of value".

Through the study and analysis of the services systems, it is possible, on one hand, to enhance and emphasize those factors that enable collaborative and adaptive co-creation of value and, on the other hand, to define balanced framework and marked by mutual logical benefit that allows access to and the sharing of resources. In addition, these systems can be individual (individuals) or groups of individuals (families) who live and evolve through an exchange and use of resources (such as knowledge and skills) to other systems. It is from this perpetual incremental and adaptive interaction between systems that arises effective co-creation of value, the value of which is the opportunity for all the players to survive and make growing the systems. It should also be pointed out that the systems in relation to each other generate a network link that generates, in fact, a macro system open to new ties with other macro systems whose ability to create value is not given by the mere sum of the potential of every single element (quantitative factor), but by the quality of the links and mode/coordination requirements and management of flows in/out (quality factor).

This phenomenon of macro and micro services systems in the perspective of networks is strongly related to *service-dominant logic* (SDL), even if there are critical remarks about the way the SDL approach articulates the relationship between the actors in the co-creation process [9, 21].

Relationships with customers, intangible property and the co-creation of value with the customer in fact form the basis of the production of services by businesses [7]. As expressed by Dalli [22], "undertakings shall make available to consumers the resources necessary for the generation of value. Under certain conditions, the consumers can be considered manufacturers and even themselves suppliers of the companies for the preparation of the necessary resources to provide the services required by the market. Everything on the assumption that consumers do not ask for goods or material objects, but functions, activities and, in general, services: these are services that are the basis of the perception of value". Hence, Vargo and Lusch [18] point out that "the customer is always a co-creator of value." According to Grönroos [3], organizations, specifically service providers, only produce the resources or the means to make it possible for customers to create value for themselves. In this sense at least, when vendors and customers interact, they are involved in co-creating value.

In this perspective, all businesses are ultimately service industries and, as a consequence, we can consider and adopt the *service dominant logic* (SDL). Vargo and Lusch [7], in particular, drawing from marketing studies, argue that "new perspectives converge to form a new dominant logic for marketing, in which the provision of services, rather than goods is fundamental to economic exchange". In this approach, the service (rather than the product) is what creates advantage for the customer and, accordingly, the goods are interpreted as simple tools or mechanisms of distribution of service provision. The service, therefore, is the general case, the common denominator of the exchange process; in fact, the service is always exchanged, while the goods when they are used, are the supports for the process of services delivery.

In general, the level of the service economy is the fundamental basis of exchange (exchanging services for services, the service is the wealth, the physical property is only its envelope), physical assets are only mechanisms for the distribution of services, in the sense that their value derives from the use, that is to say, from the service they provide, and then all economies are basically economies of services. The customer is co-creator of value, in an interactive process with the service provider. The latter is not able to create value by itself, but provides it collaboratively using resources and contributes to the value following the acceptance by the customer of such interaction offered.

Vargo and Lusch [8] raise some fundamental assertions underlying the emerging logic dominated by the service (Service Dominant Logic - SDL) which is opposed to the traditional logic dominated by the goods (Goods Dominant Logic - GDL).

The Goods in the Dominant Logic (GDL) aims of economic exchange is to produce a good and make it available for sale. Through the production process the company attributes the value to the good which represents the economic value that the market is willing to recognize and to pay to get hold of that product. Then, the more a company optimizes the production process through standardization actions that reduce

waste and non-compliance, so much more of the same it will get the maximum efficiency and profit.

In the Service Dominant Logic (SDL), the goal is the *service* and it argues that however, "when the goods are involved, they are instrumental to the release and application of resources" [18]. Hence, SDL focuses on the principle of operant resources, such as knowledge, skills, information and reports, which are dynamic and intangible resources typically human, organizational and interpersonal. Instead, the logic GDL focuses on the principle of exchange between operational resources, typically static and tangible, as the raw materials used to create goods or products.

Ultimately, the paradigm of Service Dominant Logic (SDL) proposed by Vargo and Lusch [7, 8] shows the importance of consumers as "economic and social stakeholders that interact within networks". Thus, it argues that the value is the result of healthy approach application operant resources which can sometimes also be guided through goods or materials on which to act. The value is so co-created by the commitment integrated "systems" such organizations, employees, consumers, social partners and all the other parties with an interest in operationally share the resources available according to their specificities and needs. When we follow and adopt SDL logic, the distinction between producers and consumers, in fact, disappears and all the actors/participants become active players in the co-creation of value for themselves and for others. It acknowledges the customers as integrated resources (as well as suppliers), in line with the concept co-creation of value.

Co-creation can also be regarded from consumer studies cultural perspective: some authors, such as Holbrook and O'Shaughnessy [23], as well as Belk and colleagues [24], show that consumption is as a highly symbolic and cultural activity in which consumers give products and services subjective meanings. In this sense, consumers and organizations are responsible for creating the value of the goods and the services available in the market: The symbolic and cultural meanings that consumers co-create are the very reason for their attractiveness [25]. Recently, according to the consumer culture theory (CCT), scholars began to actively participate in the debate on co-creation [26, 27], seeking recognition for the importance of this theoretical perspective regarding gaining a better understanding of co-creation in the consumption field.

Other perspectives that can be considered when delineating the co-creation field boundaries in management-related theories, are those of innovation studies è [28, 29, 30], which focus on collaborative and open processes involving organizations and users. Information systems research belongs to this domain, thus focusing on customer relationship management [31], technological platforms for customer engagement [32, 33], and open innovation platforms [34]. Numerous marketing subfields often reinterpret their backgrounds from the co-creation perspective. These subfields include business marketing [35, 36], experiential marketing [12, 13], communication [37], and branding [38, 39].

Furthermore, various perspectives have critical concerns about co-creation. As mentioned above, the theoretical perspective by Gronroos [21], who helped to identify and elaborate analytical aspects of the theory of co-creation, especially in relation to the SDL approach. In this sense, the contribution by Gronroos and colleagues [4, 40]

is, among others, to shed light on them analytical processes involved in value creation, that is the supplier process of providing resources for customer use and the customer process of turning services into value.

O'Shaughnessy and O'Shaughnessy [41] criticize SDL approach, because it seeks to displace other managerial theories, mostly marketing, and to become an all-encompassing paradigm. These authors challenge some aspects of SDL internal logic and suggest a more contingent and "democratic" theoretical development in the co-creation field. Another important contribution to the theory of co-creation comes from Edvardsson and colleagues [42], who complement the micro-analytic perspective that SDL scholars have developed with a social construction approach. According to these authors, social forces, actors, and institutions affect value co-creation: Providers' and customers' positions in the social structure and their participation in processes of signification, domination, and legitimation affect the likelihood of their deploying an effective and mutually satisfactory co-creation process.

Finally, involving customers in the value creation process may be seen as a form of exploitation if the "working consumers" are not adequately compensated [43]. At the same time, considering and employing customers as partners have been criticized as a way to manipulate them [44].

3 Co-creation value in the sport events management process through technology

This theoretical study conducted a broad review of the literature on the topic investigated, specifically we considered only studies focused on the sport events clearly related to the new technologies. The prevalent contributions in the literature were identified from a 26-year period (1989 to 2015)[1]. A search on line was conducted adopting the key words "sport event", "technology", "co-creation value", "social media", "service-dominant logic (SDL)", "event management process", "communication", "IT", "sporting activities", "sport competition" in Google Scholar, one main freely accessible web search engine specialized in academic literature, and in the ISI Web of Knowledge, in the category of management, medicine, educational, and so forth. The key words were searched only in the published papers, not including books or book chapters; we briefly read the abstract of each paper resulting in the search on line and went through the complete reading of the paper, after evidencing its relevance for our research goal.

The selected papers responded to three criteria. First, they must be published in journals in the range 1989-2015. Second, the selected papers have to be in English language and contain in their abstract at least the word sport event or its derived terms and the other key words selected in the full text and terms directly or indirectly referred to all the key words. Third, the articles have to deal with research issues rather than specialty topics, it means we selected papers from management, educational, medical, physical activity and all the issues available. Beyond journals

[1] First 6 months in 2015.

traditionally with high impact factor, we also considered journals of relatively lower ranking.

The reported studies (only papers published in English language on journals in different research areas) were analyzed to identify mainly the trends of the literature on sport events and technology by adopting the co-creation value approach.

Thanks to our review, we can evidence that the contributions in the literature, considering any research areas, are still scarce on the sport events topic related to new technologies, especially in the perspective of co-value creation that could be adopted in the sport event management process. Indeed, no relevant studies concern the importance of the application of co-creation value in the sport events management process through the support of technology. But at the same time, the phenomenon starts to receive a weak attention by scholars and practitioners. At this point, we summarize the few and most relevant studies evidenced in the literature, starting from the event and sport events concept and how it is interesting to match this topic to co-creation value perspective through the new technologies.

Events generally represent a strategic tool that combines principles and professional techniques from different disciplines, like marketing, organization studies, human resource management, economics, and so forth; it is a modular instrument, multimedia, high communicability, interactive, flexible. It can help to establish or develop the relationship between the sponsoring organization (company profit, public entity, non-profit organization) and its different audiences.

The decision to resort to the creation of events is not only due to crowding of the space in traditional media, but also by precise strategic choices that allow organizations, primarily the hosting community, to reach the public in a completely different way from traditional advertising. Interactivity, direct contact, one-to-one communication, high emotional involvement, are the elements that characterize these instruments. There are many reasons that lead organizations to choose the events: among others the opportunity to facilitate access to the media through media relations.

Since 2000 we observe a significant increase of the attention of scholars and practitioners on the topic "technology in the sport events". First of all, "sport event", can be conceptualized as "a type of product/service whose core is to provide a specific show consisting in a sport competition in which athletes of several disciplines perform creating high uncertainty about what it will happen, justifying the participation of many stakeholders, especially event organizers" [45: 204].

More specifically, sport events consist in games and meetings during which sports activities take place agonistically and professionally or not, planned individually or combined with other events, creating a concrete social media event with a strong social, cultural, recreational, environmental and economic impact on all the actors in various ways involved to the creation and enjoyment of the same event". Likewise, event organizers or event managers generally can be defined as the individual or organization responsible for overseeing, planning and managing temporary or permanently all the activities related to a specific event.

In particular, the sporting event is a versatile tool and suitable to pursue a multiplicity of economic and social objectives belonging to a myriad of subjects, public and private stakeholders that make up the event: the manufacturers of sports

(athletes, associations, sports clubs); sports distributors (mass media, facilities managers, educational and cultural institutions); those that support in various ways the sport (sponsors, national and local institutions); sports users (spectators, event participants).

More specifically, sport event organizers can be represented by local governments of the host community, or sport federations, or easily sport companies or any other private or public organizations, individual or collective organizations, which assume the main role in planning and managing all the sport event organizational and managerial process

Most scholars and practitioners impose a rigorous perspective to interpret this object of study as an independent business where the active involvement in their creation by end-users can create an advantage for the success of the same, as well as the satisfaction of the same event participants.

In all of the business administration disciplines, organizations, that is firms, are investigated from the outside, via interviews, surveys, and statistical analyses. In the art of business creation approach organizations are investigated from within by participating in the creation as part of the entrepreneurial team, for example, in the role of a knowledge investor.

Business research uses the co-creation approach but it has not yet been adequately adapted to sports environment. Co-creation in sports takes place automatically and it is not realized usually by the recipients. Value in sports is especially created by numerous stakeholders, such as the spectator. The active role of the spectators creates value for sport, thus this interaction can be examined to increase value at this specific co-creation.

Considering sport events in the perspective of co-creation approach, they can be described as services that are demanded by different reasons. For example, sport spectators experience good stadium service quality by different dimensions: perceived team performance, stadium service quality and spectator induced atmosphere. Satisfaction is led by fulfilling all three dimensions [46]. Thus, the value is created by different parties. Furthermore, this value depends not only on the origin value creator, but it is spread over several participants. Business drifting integrates the customer into the value creation that leads the customer to an active role of value creation [1]. The interaction leads to a cooperation for innovations within the networks [30]. Successful customer integration needs two aspects: information about customer needs and information about how to best solve these needs [29]. In this direction, in order to collect, manage and share information and data between the players, organizations and customers for sport events, technology play a significant role, because it could significantly facilitate these interactions. Therefore, insights about the costumer are needed before the top and middle management can implement specific approaches.

Likewise, in recent years, digital technology has led to the development of social networks (e.g. Facebook, Twitter) which are an important resource for a wider dissemination of sport events and support of the needed collecting, processing and management of information and data about the same sport events for the players involved. The social channels provide the ability to "take out" the sport event, and given the immense contribution they can make, should not be underestimated. Social

media today are a way to create a virtual reality on various platforms through which you can communicate and share interests, opinions and any type of content. The combination of social and sport events now not just about the promotional aspect is relevant, but many other factors related to the interactivity of the sport event, and in general the overall management process, the most direct and immediate involvement of people (even distant) and the ability to extend the life of the event acquire importance too.

Thanks to the advent of the internet first, social media and smart phone later, the relations have begun to move gradually in a network, so the sport event organizers have started to take advantages of social platforms and they became the main means whereby to extend the scope of their event. Also, sport events are social by nature: they allow people to find contacts, to exchange information, to identify new suppliers or customers, to share especially the same passion for specific sports. Social media is a natural extension of the events sector, specifically sport events, because they combine the same basic elements of event marketing. The benefits of this sector deriving from the advent of social media are different.

Then, Internet provides a convenient platform for integrating costumers to create value or to experience their needs. Specific tools are suited to explore customers' thinking first before integrating them into co-creation. One tool is the *netnographie* that is composed of internet and ethnography [47].

Ethnographic research helps sport event organizers to understand the customers in terms of cultural trends, lifestyle factors, attitudes and how social context influences sport event selection. Traditionally, when sport event organizers want to determine how sportspeople feel about a sport event, they may employ focus groups. These groups meet in a room and discuss the topic at hand. In contrast, what Ethnographic research does is take away the room, remove artificial settings and throw open the door to the real world. Ethnography has its roots in anthropology, where it is used to study cultures and societies. The idea is to observe rather than interact. For this reason it is an useful research tool for sport event organizers who want to get to know people and their culture.

It is made up of a range of techniques but a key characteristic is the need to talk to people in their own environment, often at their home or at work and this is where they "tend to be more open and honest in their answers" [48: 1]

The process, often referred to as ethnography, can result in breakthroughs for sport events, offering an insight into what people are really like, rather than what they want researchers to think they are like.

Ethnography isn't just about filming an interview with people, he explains, you're looking for contradictions between what people say they do and what they actually do. Ethnography allows deep insight into the contradictory nature of much of human behavior: the focus is on what people really do versus what they say they do. In other words, it is about identifying hidden needs and this is where the real breakthroughs can occur.

It is justified to wonder if social media and mobile technology could open up ethnographical studies to more organizations and, if so, what they can expect from this kind of research.

Most researchers agree that effective studies are those that involve the least disruption. Researchers might interject to ask why somebody did something, but generally the idea is to observe real life. This is where technology can help. Thanks to Facebook, Twitter and smartphones, consumers have got used to reporting what they do, when they do it and why. Mobile ethnography is an increasingly popular tool, sometimes known as 'life logging', with subjects carrying cameras to record events as they happen. With mobile technology and people more willing to share their thoughts, you don't have to traipse around after someone all day they can send you an email, photos or a video diary. Hence, ethnography can be expensive, but the combination of mobile technology and the willingness of customers to share their experiences will make it more accessible to many. Technology will help in this respect, with more of the recording done by people themselves. They can wear cameras around their necks, send video clips via their Smartphone and provide instant responses and updates via apps.

Ethnography, by its very nature but it needs to be embraced. After all, you are studying real life and understanding that it can make a real difference to everything from new products to how you communicate with your customers. Ethnography focuses on conversations and social interactions in the internet to figure people insights. The other two used tools are described as idea contest and lead user method. The logic behind that order is asking for topic relevant input (idea contest) guided by people that are into that topic (lead user method) to start, maintain or comment web discussions (netnographie). The process of generating innovations has three steps (gathering innovations, voting for the best one and rewarding the best one). After gathering the statements the collected data are clustered to super ordinate topics that are evaluated to the new service.

At this point, regardless of the choice of communication channels and the type and nature of sport events, it is essential for almost all events to have a small presence or indirect social media. To increase awareness of the public of an event and, therefore, the participation, the sport event organizer should have a strategy and a well-designed communication plan: it must start from the marketing objectives of the event organizer or entity organizer, from the analysis of the target audience to the choice of the media to be used. The numbers, as the amount of "Like" or comments on a Facebook page, do not speak for themselves, but provide important information if used to understand what people think and want [49]. Indeed, it is possible to integrate different media in a single analysis, knowing that those organizations cannot only get information, but also to respond to consumers by establishing deeper relationships with them, which could materialize into successful sport events. It is important to remind that social media are not vertical, such as advertising or public relations, but they are a horizontal instrument that touches the entire business, from customer service, acquisition or customer retention [50]. With social media you can "co-create value" through direct communication with the public, for example, by taking actions such as: "Respond to every comment and all questions that directly involve"; "Leave space on their pages or those of others to post events that you find useful or interesting"; "Keeping a blog, a section of the site, or a series of posts on themes dear to your target audience". Event organizer, bringing content, people, interesting

materials in the event, also during the planning and managing process, the media and users will be more interested, expanding awareness, adherence and satisfaction with the organization. With the power that social media give, people become important to pay attention to small details, so it is crucial for the organizers to manage feedback. If anyone had negative impressions in an sport event for any reason, even from acting independently of the organization, social media can represent the perfect medium to make their voices heard and criticisms.

In general, Internet and all the related new technologies give the opportunity to reach a wide audience, opening the doors to all users interested in attending the event. Social media enable participants, and all the general users, to get to a target not only large, but also very accurate, making it easier to search for specific types of users, and the segmentation of its audience. Social media users reveal their personal details and auto-select the topics they are most affected, becoming a fan of the Facebook pages, participating in discussion groups on LinkedIn, or tweeting topics of interest. The promotion activities may be selective and scrupulous, avoiding to reach not interested audience. The participation requires a more selected process especially for its estimation, and if you want to sell tickets, Internet and social networks are tools through which this practice will be easier for the users and less expensive for the sport event organizers.

The sport event organizers can obtain significant advantages, especially in terms of effective and efficient management of sport events, as a part of one system composed of numerous and unlimited possibilities of communication with participants. Such communication is no longer only the store, but it makes the company an integral part of consumers' conversations. Social media marketing, therefore, begins by listening to their consumers through various online channels. Once you understand interests, behaviors and language, organizations can lead to conversations to improve customers' feelings about the event, to have a stake and thus increase sales. Underestimating the potential of social media can be an unforgivable mistake, especially for those organizations involved in event management process [51]. As shown by a survey carried out over 2000 XING event organizers, mainly Europeans, trust in social media continues to be strong. Almost all the event organizing companies, especially the sport organizers, as shown in the last sport mega-events like the Olympics, are planning an increase in social media activity for the future. In 2014, in general, the event industry has seen an expansion of the online business, following the trend of recent years. It will be interesting to see if the event organizers are willing to continue to invest more and more resources, and if social media will continue to evolve in this direction, developing new qualities and potential suitable for this area.

In summary, in this direction, recognizing the relevant impact of social media use on the planning and managing sport event management process, we argue that, thanks to the new technologies, it is possible to adopt the co-creation value concept in SDL logic, as the technology better supports the interactions between all the players involved, mainly the event organizers and customers, increasing their contribution to create value through the sport events services.

4 Concluding remarks

All the users, including customers, as specifically visitors or passive participants of sport events, have more freedom to interact with the organizers of sporting events through the use of social networks. Hence, the co-creation of value contributes to determine the sport event positive impact, measured in terms of socio-economic benefits and the number of participants who always show their satisfaction through social media.

Therefore, co-creation can be seen as a business strategy even in the case of sport events sub-field that emphasizes the creation of a corporate value shared with the customer/visitor. As already outlined, the idea behind this process is the vision of the market as a place where the various actors involved (companies, consumers, employees, shareholders, suppliers) share, combine and renew together the resources and the ability to create value through new forms of interaction, like the social media.

They are expanded collaborative networks using digital communication forms to stay in touch with users, and with all that is outside of the organization, to give them a central role by transforming the users into participants.

Certainly, the co-creation is not an innovation process that guarantees its success, there is in fact no certainty that the ideas, and especially, the realization of sport event management process will be successful, responding to effectiveness and efficiency criteria. But the result is that the thought of the project value increases as it comes from personalized and unique experience for the consumer, as well as a better perception of the event by the organization. According to co-creation economic perspective, this can lead to an increase in revenues and profitability because the co-created will meet more the costumers' needs and requests in terms of standards and required services, which will increase as a result of their participation.

This process, in which organizations adopt different channels available to consumers to allow them accessing to more direct and engaging experiences, can also be seen from an opposite point of view. It is possible that the phenomenon of co-creation is perceived as a form of free exploitation of ideas and "energy" external businesses. Also, we should support a "mutual growth" for both parties involved, so that the event organizer and users can develop in parallel, taking advantages of each other but respecting equity criteria. It is important that both parties have benefits, including material as rewards customers/co-creators with free products/services, because the collaboration to create new ideas does not become a form of free exploitation, but an enrichment of mutual value.

This explorative and theoretical study have several limitations, mostly because of its nature, in fact, it is still at the first step of its long development process that allows only to represent and describe still undeveloped ideas about the phenomenon investigated. In the future development of the study, we might conduct a meta-analysis to identify in a wide research design the main variables of the impact of technology on the sport event management process adopting the co-creation perspective, and also considering theoretical frameworks and not easily describe the prevalent existing contributions.

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Parliaments co-building e-democracy with citizens

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Abstract. Technology as bridge between government and citizens helps the development of democracy leading parliaments to modernize processes and improve communication with citizens by constructing and enabling knowledge for designing public policies and creating public value. The aim of this paper is to describe how parliaments contribute to develop democracy using technology for encouraging the participation of people for building policies and engaging citizens playing a proactive role in democratic decision-making processes as co-producers of public value.

Keywords: e-democracy; e-parliament; co-production; e-participation.

1 Introduction

Technologies enable public organizations to sustain public trust by encouraging an active citizenship and enhancing the interaction between citizens and public institutions. The role of technology is to make democratic and public institutions less distant and open institutions paying attention on citizens' needs and called to intervene in order to face questions dealing with problems by contribution and inputs of citizens [1, 2, 3]. Creating and maintaining public value relies on searching for dialogue and building partnerships between public institutions and citizens as active co-producers of public value [4] coherently with a public value management paradigm relying on restoring trust and legitimacy, producing outcomes as performance objectives [5]. Technology helps parliaments coping with the crisis of legitimacy of representative democracy by making available documents and information about legislative processes as to appear as democratic and accountable institutions effectively engaging citizens in the policy process [6]. Technology as digital bridge between legislatures and citizens helps democratic processes leading parliament to modernize workings by managing information and knowledge in order to improve communication with citizens for producing knowledge for public policies design and contribute to reinforce and revitalize democratic values and systems [7, 8]. Technologies contribute to define a networked co-production driving the transition from a government/agency-centered to community/citizen centered approach where citizens interact with government agencies to co-produce [9, 10].

The aim of this paper is to describe how technologies help and lead parliaments as representative institutions to develop and sustain democracy encouraging participation and engaging citizens as co-producers of public value and contribute to

develop public policies. The study is based on archival and qualitative data drawn by a literature review about the use of the Internet and technologies of information and communication (ICTs) within parliamentary institutions. The contribution of this study is to propose a framework of analysis in order to identify a path driving parliaments to connect people to public institutions and interact with citizens for constructing and building public policies and co-producing public value for society and community. Technologies encouraging participation of citizens in policy making tend to orient different results in terms of services delivery and outcome, quality, efficiency and equity [11].

The paper is organized as follows. In the first paragraph, in the introduction the contents of the paper are elucidated. In the paragraph two it is elucidated how public organizations and citizens can co-produce public value by the use of technology. In the third paragraph parliaments use technology for obtaining legitimacy and sustaining democracy. In the fourth paragraph the role of technology for parliaments modernizing processes and encouraging participation is explained. Parliaments as organizations information based and knowledge oriented tend to design an e-parliament by improving openness, information and communication with citizenry, encouraging participation for co-producing value and knowledge for designing and implementing public policies choices with citizens. In the fifth paragraph a framework of analysis is presented to identify a path driving public organizations and co-production to proceed towards sustainability. Finally, conclusions and future research perspectives are elucidated.

2 Public organizations and citizens co-producing public value by technology

Public organizations tend to serve the public interest as responsive institutions in front of the people by developing a process of effective collaboration with citizens as partners [1, 2, 3]. In an era of declining trust of citizens towards public institutions public organizations seeking legitimacy as credible institutions tend to follow a public value management paradigm searching for dialogue and partnership with citizens as active co-producers of public value encouraging the cooperation between democracy and management for engendering public trust and sustaining legitimacy of public agencies [4, 5, 12]. Technologies permit the development of information and knowledge sharing through interaction between public institutions and citizens [13]. Public institutions increasingly tend to use ICTs to support democratic processes in order to improve an interactive relationship with citizens to be engaged for participation and involved for contribution to policy-making in order to foster transparency, openness, and legitimacy by enforcing democratic public values as impartiality, equity, honesty and fairness of government [14]. Technologies contribute to design a networked co-production driving the transition from a government/agency-centered to community/citizen centered approach where citizens tend to interact with government agencies enabling citizens to co-produce [9, 10]. Technologies support active co-production empowering the role of citizen as

responsible partner [15]. Internet-enabled collective co-production tends to benefit the decision making and the community [16]. Co-consultation as process involving citizens, experts and professionals in planning public services contributes to empower citizens as active co-producers of services they receive. Co-production of public services may evolve by bridging knowledge sharing and participation, strengthening a proactive partnership driving a learning process by which public organizations select adaptive ways to provide public services [17]. Co-production does not lead automatically to successful initiatives still moving to maturity for engendering successful long-term outcomes for communities and society providing efficiency on processing and sharing information for enriching knowledge management [18].

3 Parliaments seeking legitimacy for sustaining democracy by technology

Parliaments as institutions perceived as cause of disengagement of citizens with politics tend to pursue legitimacy enhancing credibility of their actions by embracing technologies of information and communication for restoring trust with citizens by strategically planning a public engagement agenda [19, 20, 21]. Parliaments need to obtain the social support of citizens by developing information and communication flows with constituencies in order to legitimize policies strengthening the channels of engagement for networking and for sustaining public trust [22]. In modern societies characterized by complex decision making parliaments tend to behave as mediators in transition from merely representative democratic forms to governance networks developing coherently with horizontal forms of accountability and power [23]. Parliaments as symbols of political integration and sources of coherent policy [6] are managing technology in order to sustain the values of representative democracy for surviving as accessible, transparent and efficient institutions [24]. promoting citizenship and accountability, fostering greater engagement with citizens toward a participatory parliamentary democracy [6, 25]. Technology helps the development of democracy by enhancing both political process and the direct involvement and participation of citizens in order to improve quality of opinion formation by opening up to new spaces of information and knowledge sharing for equity deliberation [26]. Moreover, technological modernization and advancements do not automatically make available new spaces, places and forms of democracy because of varying political context and dynamics in different countries [27] influencing the future of parliamentary information infrastructure and shaping e-democracy practices [28]. Thereby, parliaments may select different choices managing technology in order to improve citizen participation and involvement in decision making processes (deliberative or strong democracy); to reinforce representative institutions engaging people to participate in the political system (reinvigoration); and to improve both quality of information exchange government-citizens (liberal or thin democracy) and sustain the image of representative institutions implementing websites for seeking legitimacy and consensus, by better performing their tasks (modernization and reform) [6]. Parliaments should engage citizens communicating how the institution

works and showing how the feedback and inputs by the public are considered by legislature [29].

4 The role of technology for parliaments modernizing democratic processes

Technology is driving parliaments to support the development of democracy by improving the relationship with citizens by modernizing internal workings, fostering transparency and participation in political processes, by engaging citizens, opening up to participatory forms and initiatives for increased accountability. The Internet helps to enhance the quality of democratic governance and public participation making a better information and producing knowledge for citizens actively contributing to public choices in terms of accessibility, equity and openness to different views in order to revaluate policies with changing contingencies and new knowledge [30].

4.1. Parliaments as information intensive and knowledge based organizations

Parliaments as democratic institutions have to issue and enact laws, represent the interest of voters and oversee the executive branch of government monitoring the work of the executive authority. Parliaments are integrating technologies of information and communication into their work to enhance and strengthen parliamentary functions (representative, legislative, scrutiny, oversight, legitimacy, education, conflict resolution) fostering communication possibilities, dissemination and management of information [31]. Parliaments producing knowledge policy making related by documents, laws, acts [32] are considered as information intensive organizations and media infrastructure [27, 31] developing sources of knowledge to effectively contribute for policy formulation and promote accountability engaging citizens [7]. The Internet as engine of change helps to design efficient processes and produce impact and effects on legislative processes and procedures as tool of control and evaluation on public policies by reinforcing the lawmaking functions and operational activities of parliamentary assemblies [33]. Parliaments as organizations managing knowledge and technologies should develop transparent processes that facilitate effective two-way transfers of knowledge between public organizations and stakeholders to better develop sustainable policy solutions [34].

4.2. Building the e-parliament

Parliaments as democratic arena and institutional bridge between government and citizens should use the Internet for providing services that enable citizens to be included in decision making processes and to actively engage and interact with parliamentarians [35]. Parliaments are embracing technologies in order to build the e-parliament as an efficient organization where stakeholders tend to use and manage information and communication technologies to perform their primary functions of lawmaking, representation, and oversight more effectively. Designing the e-

parliament implies to structure and build a legislature that is empowered to be more open, transparent and accountable through ICTs for encouraging people to be more engaged in public life by providing higher quality information and greater access to documents and activities of the legislative body. E-parliament may foster the development of an equitable and inclusive information society enabling citizens to participate in the policy-making process, to view and discuss parliamentary records easily and permanently available [36]. The publicity of political decision making is always a central element for sustainability of representative democracies. The practice of e-parliament making available a growing amount of information about legislative process is related to the concept of e-democracy that requires that parliamentary records have to be available to be viewed and discussed by citizens. Parliaments embracing technologies tend to behave and be perceived as more efficient and effective institutions that improve their internal workings, processes and operations, strengthening parliamentary democracy in order to provide better information to the public by improving the interface between governments and citizens, and enhance their representative role ensuring the electorate to be better connected with institution allowing citizens to participate collectively and directly in the policy process [24].

4.3. Encouraging participation for co-producing knowledge and public policy

The Internet provides a means for strengthening participation to develop the policy process as result of dialogue, values and knowledge sharing through interaction between public institutions and people [37]. Citizens want to be heard and involved in affairs and matters about *res publica* when they feel that their contributions may exert influence on behaviour of legislators [38]. Technologies of information and communication (ICTs) contribute to revitalize democracy for sustaining and enforcing an informed and critical citizenry leading to an accessible and decentralized democratic representative system [39] leading parliaments to develop a trustee model of representation in order to reconcile representative institutions with the electorate and people [40]. Technology contributes to improve quality of information exchange government-citizens and strengthen participation by involving citizens in decision-making processes coherently with the development of a deliberative democracy. In a thin democracy citizens act as a customers of information gathered and disseminated by political institutions by using ICTs. In a strong democracy the citizen can act as an opinion former. ICTs mainly focus on discussion. Participation is seen as a means for providing education and sustaining an increased understanding about society [41, 42]. There are three levels to take part in the decision-making and influence the policy agenda: information is a one-way relationship in which governments make available information for citizens; in the consultation level citizens are encouraged to contribute their views on a particular issue; in the active participation citizens are empowered by actively participating in the policy making process (partnership) [43]. Parliaments tend to embrace ICTs to improve the knowledge and information about decision-making facilitating processes of information access and communication for an accountable relationship with citizens [24] encouraging both positive and negative feedback as to foster participation in policy formulation [44]. Parliaments are using an

advanced technology as computer support arguments and information visualization about legislative processes [45], structured e-forums in order to increase and improve quality and quantity of public participation reducing the effort and time requirements of being informant on current debates promoting accessibility, transparency and representativeness by widening the participation on legislation under formation [33]. Parliaments should move towards more participatory approaches than one-way information dissemination by designing organizational policies and capacity building programs [46]. Technologies lead representative institutions to develop a two-way dialogue with citizens in order to produce effectively democratic participation for engendering a meaningful dialogue by managing the feedback of citizens [35, 47]. Parliaments tend to behave as hesitant institutions communicating with citizens online being mainly interested in one-way information provision [48] making a limited use of interactive features and leading citizens to comment and deliberate on policy and legislation issues [49]. E-participation and e-petitions contribute to legitimize parliamentary institutions in response to declining trust of citizens even if it is too early to evaluate [50]. Parliaments beginning in using social media privilege the provision information about parliamentary business than sustaining participation [51].

5 Towards Parliaments co-producing policies with citizens: a framework of analysis

Parliaments should use technology as a means to provide information about legislative processes and communicate with citizens involved to participate and contribute to policy making processes. Parliaments as intensive information and knowledge-based organizations behave as accountable institutions encouraging citizens to be included in decision making processes. Parliaments embracing technologies can decide to select an information or knowledge management approach for redesigning internal processes and developing channels of communication with people. Parliaments tend to introduce technology and the Internet for modernization or reinvigoration of processes for enhancing their role and image in front of the citizens. Parliaments are seeking legitimacy in front of the constituency by introducing and using technology for dialoguing with citizens as democratic representative institutions making available data and information and promoting accountability by designing e-participation initiatives for building shared and legitimized policies as choices accepted by people. Technology is leading parliaments to behave as responsive institutions managing information and knowledge for building democracy. Co-production of democratic values as public service relies on the importance of collaboration and networking between government and citizens for creating public value for society and sustaining an aware and active citizenship for policy contribution. A framework of analysis is presented in figure 1 to identify a path driving parliaments to interact with citizens building a participatory democracy bridging direct and representative democratic forms emphasizing the aspects related to co-production towards different choices by leading to openness based on

information provision or enhancing accountability and active citizenship in terms of active participation.

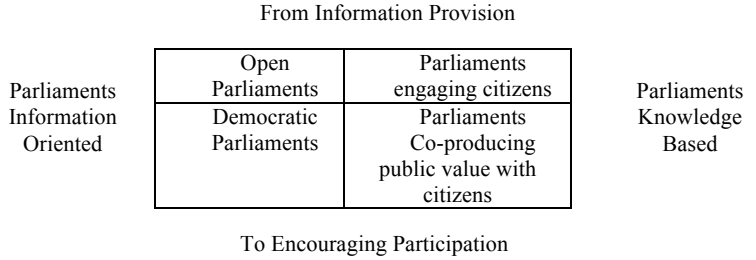

Fig. 1. Towards Parliaments co-producing public value with citizens: a framework of analysis

Parliaments following a knowledge approach or orientation can design a sustainable development of public policies and services delivery by building consensus with a proactive involvement and contribution of citizens and various stakeholders or privilege an information orientation directed to provide access to data, information, and knowledge without involving external actors. Parliaments as organizations can behave as open and transparent institutions managing technology in terms of mere modernization of procedures and processes for enabling citizens to access to data and information about parliamentary affairs and matters. Democratic parliaments tend to select an information orientation by increasing tools for better openness and transparency providing access to government information through websites, by privileging a path for one-way communications and limited consultative processes. Parliaments as information oriented organizations are in early stage in understanding the role and contribution of participation for policy making as opportunity for building consensus and knowledge about public choices by involving and engaging citizens. Parliaments co-producing public policy and value with citizens tend to develop a knowledge management approach in order to improve internal processes and behave as accountable institutions engaging citizens in policy process as result of a dialogue and consensus, by developing an active participatory democracy and sustaining a two-way communication, involving citizens to contribute through e-petitions and e-consultations to gather inputs and receive a feedback on policy design. Parliaments proceeding towards co-production development make citizens as responsible partners and active participants in policy choices and services design for building a participatory democracy behind the classical role of the parliamentary institution within a liberal democracy.

6 Conclusions

Technologies help to reconcile public organizations and citizens. Technologies seem to drive modernization of public sector organizations becoming more accessible and

democratic for citizens asking their voices to be heard and opinions to be considered by public institutions. Parliaments tend to proceed towards sustainability of democratic proposal and value by following an information or knowledge orientation in managing technologies. The future development and primacy of parliamentary democracy relies on representative institutions as parliaments developing an information or knowledge management approach in managing legislative affairs and policy making by promoting openness, transparency, accountability and participation ranging from merely information provision to encouraging an active participation of citizens searching more and more a direct contact with people in order to enhance and modernize core processes under an increasing pressure for proceeding towards a sustainable creation of public value. Technologies offer an opportunity for human communities building a more open and democratic society. The introduction and use of technology within political processes should help representative institutions to reconsider strategic choices and organizational arrangements in order to involve citizens in the institutional infrastructure concerning debate and dialogue on policy choices and options. The contribution of this study is to provide an analytical framework in order to identify a path driving parliaments to sustain co-production of public policies for upholding the values and democratic acceptance of public institutions, leading to better design and implement effective quality of public services. Public institutions need to sustain and encourage the involvement and participation of citizens perceiving public institutions as distant and far organizations, feeling distrusted of political institutions' performances in order to participate and access to government information and knowledge discussing themes and questions, by promoting debate and public consultation. It should be interesting to investigate how parliaments are engaging citizens sustaining active participation through a significant and meaningful contribution through use of social media.

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Agent Based Modelling for Decision Making in Energy Policy

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Abstract. The paper describes a decision-making exploratory modelling approach to simulate different situations leading to a sustainable consumption of energy. An Agent Based Model (ABM) is proposed in order to study the individual and collective behavioural changes toward environmental sustainability using ICT-based services, the SAM4SN (Spread of Awareness Model for Social Norms) model. It explores the role of awareness in the consumption of a resource. Simulating how environmental awareness spreads is an interdisciplinary issue that involves ICT, energy and environmental science, as well as social and behavioural sciences. The agents of SAM4SN represent households whose consumption of energy has to be reduced. Agents influence each other. Such influence improves their awareness that, in turn, impacts on resource consumption. The social influence plays an important role in spreading awareness. The model includes the role of smart metering functions. The role of the sustainability tipping point in decision-making is introduced.

Keywords. Social Norms·Awareness Spread·Energy Efficiency·Behavioural Change·Social Influence·Tipping Point·Committed minorities·Socio-technical digital ecosystem

1 Introduction

Electrical energy consumption is an important issue. Energy reduction programs are sometimes launched by local government or by utilities companies. While traditionally such initiatives are coupled with regulatory interventions, in terms of laws or economic incentives, the current trend is to focus on behavioural changes. There has been a lot of attention to provide consumers with information and services to manage their energy use [1].

The paper starts from the idea that individuals are influenced by decisions, actions, and advice of other individuals, both consciously and unconsciously [2]. The focus of the paper is on social influence in the dynamics of energy consumption. However, we shall consider diversity of actors, each of which may exert a different kind of influence, and may in turn be influenced differently. The notion of social diversity

leads to a network of neighbours composed by different types of agents who are more or less influential on the basis of their level of environmental awareness. The rationale behind our model is to pivot on social norms - as opposed to prescriptive ones [3] - and look at the onset of collective behaviour as a turning point to reach the sustainability goals.

The proposed approach aims to explore the potential of Agent-Based Modelling (ABM) to describe (at the micro level) this influence and to observe (at the macro level) its general effects on the resource consumption. In particular the issue is how to represent awareness spread and how to assess the importance of smart metering functions to turn awareness into sustainable behaviours. The proposed model aims to explore if and how environmental awareness can drive behavioural changes toward sustainability and how the availability of smart metering functions can help households in reducing their energy consumption.

An interdisciplinary overview introduces the background linking environmental challenges and energy consumption, with individual awareness, behavioural changes and social norms. The main focus is on environmental awareness as social limiting factor to avoid overuse of a resource. We will introduce the ABM paradigm for providing a description of the awareness spread and its effect on energy consumption. SAM4SN (Spread of Awareness Model for Social Norms) model simulates social influence and its effects in achieving a given target of consumption reduction. The community modelled in SAM4SN is composed by households that can access different types of smart metering functions, allowing us to compare their consumption patterns with the ones of other consumers, as well as to dynamically re-define and share their individual reduction goals.

The concepts of tipping point as well as of committed minorities are introduced. SAM4SN is a tool for decision makers to investigate, for example, initial configurations of different types of agent leading to sustainability and the required number of committed agents to enable a social norm. Such kind of investigation is important for planning campaigns or initiatives based on social norm effects. A decision maker can pivot a policy on pilot programs to support selected groups of people to become proactive. It is possible to discover that a nucleus of strong initial commitment against an environmental goal can counter any effort to promote it.

2 Environmental challenges, awareness, behavioural changes and social norms

On October 2012, the European Union adopted the Energy Efficiency Directive (DIRECTIVE 2012/27/EU) in reaction to the fact that EU Member States were not on track to reduce primary energy consumption by 20% by 2020. The implementation of this directive, and other policies that have been adopted in more recent years, requires a change in consumer behaviour and energy consumption practices [4]. The Article 12 of the above mentioned Directive focuses on “consumer information and empowering programs” to promote behavioural changes. Voluntary behavioural changes are usually driven by some kind of reward. As far as environmentally sustainable

lifestyles are concerned, economic rewards are often not strong enough to trigger a behavioural change [5]. Individuals are influenced by the decisions, actions, and advice of others when making a wide variety of decisions, both consciously and unconsciously. However, positive effects on the environment can only happen when an entire community adopts a responsible life style. Our purpose is to explore how environmental sustainability awareness can drive people's behaviour.

According to the Oxford Dictionary, awareness is defined as "a concern about and well-informed interest in a particular situation or development". Awareness does not coincide with information: people may have plenty of information about something without being aware of it. Rather, awareness is an individual aptitude that is developed and shaped inside a social context. Understanding how and when this awareness arises should therefore be considered as a central issue in any theory of collective social behaviour [6]. Some researchers [7] have argued that participatory processes are based on psychological mechanisms like social proof or social influence. We claim that such mechanisms are amplified in an ICT-based social dimension, where technology enables users to progress from a passive role to an active one.

Previous research has identified two essential factors for encouraging people to act: providing them with feedback on their situation and assisting them in setting their goals [8]. Such factors can be enhanced by ICT-based tools, able to motivate people to modify their behaviour [9]. These factors can be readily adapted to the encouragement of environmentally aware lifestyles. The first factor can be stated as providing individuals with real-time access to information about their personal resource consumption, while the second is providing them with a way to compare their lifestyles with some environmentally aware benchmark.

The mechanisms of psychological ownership, social proof and social influence are basic concepts to approach behavioural changes in resource consumption. Psychological ownership [10] describes a state in which a person feels closely connected to an object or idea, to the degree that it becomes part of her "extended self".

To be correctly used, instruments have to be appropriated by users [11], i.e. contextualized in their daily routine. A way to extend a social norm is to use rewards for "socially acceptable behaviour" like incentives, although not necessarily monetary ones. As soon as people consider something as "their own", its perceived value increases and they are more likely to invest time and effort in preserving it [12,13]. Social proof [7], [9] describes how people act in a certain way because they see others acting that way. In such situations, the fact that others make a choice acts as a proof that this choice is preferable. While a mix of needs, personal desires and social images drives consumers, individuals are known to replace common background or geographic proximity with a sense of well-defined purpose and successful common pursuit of this purpose [14]. Social influence is an umbrella term for a loose congregation of social, psychological, and economic mechanisms.

The influence network – the network of "who influences whom" – impacts the dynamics of collective decisions [15], determining, for example, the likelihood that "cascades" of influence can originate from small initial seeds, the ability of prominent

individuals to trigger such cascades, and the importance of group structure in triggering and propagating large cascades. Models of social influence tend to assume (often implicitly) that all actors involved are of the same type, whereas in reality, individuals may be influenced by a variety of actors - for example, peers, role models, media organizations, and high profile individuals, each of which may exert a different kind of influence, and may in turn be influenced differently. A research area of growing importance inside social network analysis is now focusing on a special case of influence response - namely threshold rules, according to which individuals adopt a new state based on the perceived fraction of their peers who have already adopted the same state.

Threshold models are well understood in certain special cases, like all-to-all approximation where all individuals are influenced equally by the states of all others. Other studies [16] moved systematically up the complexity chain, reviewing the dynamics of cascades of influence on random networks. Other [17] models of networks progressed with respect to the random network model by including some notion of topology. For example, neighbourhood relationships defined topologically or socially are giving rise to threshold models that are more and more popular in social network analysis. The classical Grannovetter's threshold model [18] has evolved into a network setting where (as opposed to the conventional "all-on-all" influence assumption), individuals are influenced directly only by a small subset of their immediate "neighbours" according to some notion of distance. In this context, a notion of social diversity [19] is needed in order to simulate a network of neighbours who are more or less influential on the basis of their level of environmental awareness.

As above mentioned, economic rewards alone are not strong enough to trigger a behavioural change. Other kind of reward can be more effective. When a community adopts a responsible life style some positive environmental effects will happen in the long run. When the adoption of a sustainable behaviour is driven by awareness and such awareness shifts from an individual dimension to a shared collective one, this generates the most effective reward: social appraisal. Such a mechanism is the trigger for a social norm. If environmentally friendly behaviour becomes a social norm it will be carried on without any need for controls, fines or law enforcement: "Effective policies are ones that induce both short-term changes in behaviour and longer-term changes in social norm" [3]. Social norms are persistent and, once adopted, are followed even after the state intervention ceases. Making collaborative behaviours convenient may strengthen both personal and social norms. Making all behaviours more visible shows people what others are doing. ICT-based systems, as smart metering advanced functions, can be pivotal.

3 An Agent Based Modelling approach

Axelrod [20] considers simulation as a third way of undertaking scientific research, after induction - i.e. the discovery of patterns in empirical data - and deduction – that involves specifying a set of axioms and proving consequences that can be derived

from them. Namely, Axelrod remarks: “starting with a set of explicit assumptions, simulation does not prove theorems but instead generates data that can be analysed inductively, as a way of conducting thought experiments” [7]. Some questions can however be answered with simulation experiments [21]. According to Marks [22] “... a simulation might attempt to explain a phenomenon; it might attempt to predict the outcome of a phenomenon; or it might be used to explore a phenomenon, to play, in order to understand the interactions of elements of the structure that produces the phenomenon”. There are important classes of problems for which writing down equations is not a useful activity. In such circumstances, resort to agent-based computational models may be the only way available to explore such processes systematically, and constitute a third distinct usage of such models [23]. We present an exploratory model that might be used to play and explore different situations, in order to understand the interactions of elements of the structure that produces the phenomenon.

4 The SAM4SN Model

The SAM4SN allows defining a set of scenarios to study the emergence of collective phenomena that are impossible to foresee at individual level. Of course, there will be scenarios that lead to overuse of the resource, and scenarios where this does not happen because the social mechanism has a positive effect, i.e. sustainable behaviour emerges. The goal is to observe at a macro-level how awareness can spread in the community, how the dynamics of awareness impact on individual reduction goals, and how the availability of different smart metering functions impact on such mechanisms. “Green” people, i.e. people with high environmental awareness, can decide to limit the privacy of their own consumption information and share with the community their own consumption data. Such voluntary mechanism of “privacy versus reputation” is an emerging trend in some communities, where becoming a green opinion leader is perceived as a social recognition.

SAM4SN is a certified model, fully available at OpenABM [24], where a full description of SAM4SN is supplied, according the ODD (Overview, Design concepts, Detail) protocol [25]. Further details are supplied in G. Sissa, 2015 [26].

The agents represent people involved in the consumption of a limited or critical resource. Each agent models a household. Agents can be supplied or not by smart functions of metering.

We have five entity types: blind agents, indifferent agents, spectators, actives, and evangelists.

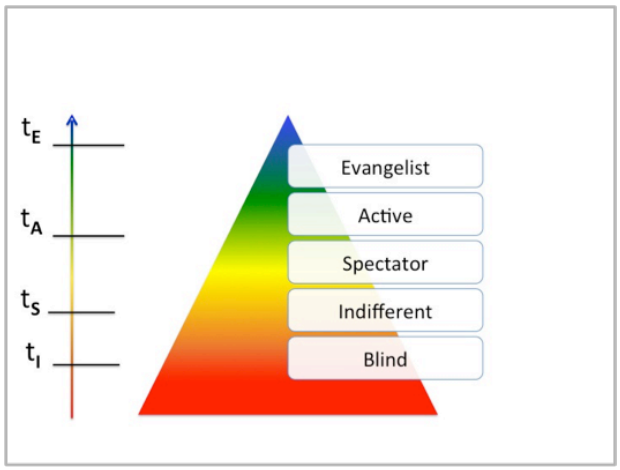

Fig. 1. Agents and awareness thresholds

- Blind agents exhibit dysfunctional behaviour with respect to the goal. As detractors of the need to prevent an overuse of the resource, their consumption pattern is only driven by their individual needs; furthermore, they mock other behaviours and have negative influence on neighbours.
- Indifferent agents, the largest group, are neutral about the environmental sustainability goal. Their consumption is constant.
- Spectator agents are quite neutral in their behaviour, but are open to listening and keen to observe their neighbours' behaviour.
- Active agents are "green" people, strongly committed to the reduction of resource consumption. They allow other people to inspect their consumption data in order to share their reduction achievements with others.
- Evangelist agents are active agents that, in addition, are able to contribute to the resource supply. They are energy prosumers.

Agents belong to one and only one type at time. A state variable of agents is their awareness, expressed as a cardinal numerical quantity (Fig. 1). Different types of agent have different awareness; such awareness is a continue variable. Other agent variables are: the agent's resource consumption rate, its own resource reduction goal, and its own resource production.

The space of agents is bi-dimensional and represents a set of households on a given geographical area.

SAM4SN agents interact by proximity and change their awareness according to the number and the type of their neighbours. Once an agent's awareness reaches a threshold, the agent joins a different type (Fig 1). The awareness diffusion mechanism is a core point of our model. It is driven by the assumption that the most influential neighbours are those lying at the two extremes of the awareness scale: evangelist at the top and blind agents at the bottom (Fig. 2).

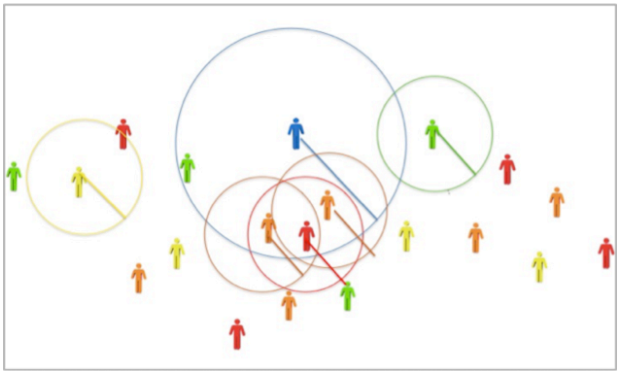

Fig. 2. Influence radius of agents

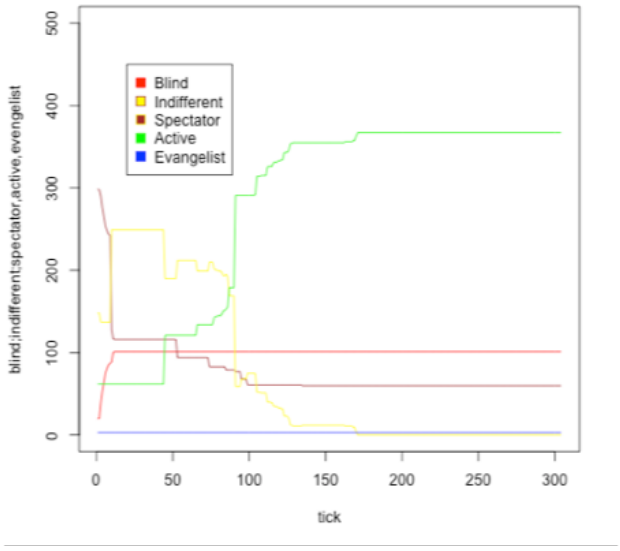

Fig. 3. Dynamics of agent types

At each process iteration, the awareness of the agents is updated (Fig. 3). A basic design principle of this mechanism is context-dependence: the influence of neighbours depends on their type. Also, the rate of awareness change and thresholds are different for each type.

Another important design principle is saturation: the "greener" the agents, the higher the threshold they have to reach for moving to a new type. A third principle is hysteresis: once agents become "green" (i.e. join the active or evangelist types), their awareness never decreases. Finally, transitivity of influence supports a kind of cascade effect, limited by the influence sphere of the agents.

Each agent has a reduction goal concerning the limited resource and progresses toward its goal at a given rate. At each run the number of agents belonging to a type

can change, while total number of agents is constant. Main global variables include the cardinality of each type of agents, the current resource consumption and an overall reduction goal.

The model evolution stops when the global consumption reduction goal is achieved. At each iteration, agents look around to verify how many neighbours they have and of what type. According to its neighbourhood, each agent then changes its awareness level. The rules to update awareness are different for each agent type. Blind agents can change their awareness only if they have completely green neighbourhoods and even then their awareness increases very slowly. After the upgrade of awareness of each agent, if the agent's awareness rises beyond a given threshold the system updates the agent state, i.e. sets the membership of the agent to a new type.

Each type of agent has a different consumption and such consumption is updated according to an individual reduction goal. The overall consumption is evaluated on the basis of the individual consumption and also on resource production on the part of evangelists.

Each agent's individual resource consumption depends on an overall reduction goal. For each agent type, the goal is computed as the difference between the previous resource consumption and the individual reduction goal that has to be reached with a given rate. The individual reduction goal varies according to agent type.

SAM4SN relates awareness change to the availability of specific functions of a smart metering system. The availability of smart metering functions can impact on such mechanisms by empowering agents.

Four classes of smart functions are identified:

- In home metering;
- Individual feedback about own consumption of the limited or critical resource;
- Information about green leaders and their low consumption profile that are taken as reference;
- Personalized advice for consumption reduction.

Availability of smart metering functions enables the agent to know its own consumption of the resource and to identify an individual reduction goal. For blind agents, it is independent from the availability of any facilitating conditions, because blind agents want to increase their consumption despite any evidence of the need to reduce it. When the function of comparison with neighbours is available, agents know the consumption of other agents and can set their own reduction goal on the basis of the minimum consumption of other agents.

The reduction goal depends on the minimum known consumption and is given by the difference between the previous consumption of the agent and the reference consumption of another agent that has the minimal consumption. Such difference is multiplied by a green-competition index.

4.1. Social reinforcement

In SAM4SN model, awareness is also modified by the mechanism of social reinforcement. A comparison takes place between the individual agent's consumption trend and the global trend of resource use. When their behaviour trends are concordant with the general consumption trend, the agents can *reinforce* their beliefs and this social reinforcement, in turn, changes their awareness. Positive reinforcement happens when both individual and global consumption trends are of reductions; negative reinforcement happens when both individual and global consumption trends are increasing.

We introduced the notions of commitment and "quasi-commitment" as useful notions when linked to the concept of social reinforcement. Once a committed (evangelist) or quasi-committed agent (a blind or an active) is reinforced in his belief, this reinforcement is persistent and the agent remains reinforced as it was (positively or negatively), while not committed agents (spectators and indifferents) are responsive to positive or negative reinforcements.

In our model, committed agents coincide with evangelists, i.e. the most influential ones, while blind or active agents are "quasi-committed". In our model awareness is affected by social reinforcement, because the reinforcement value is added to the awareness level.

4.2. The tipping point and social norms

According to some studies [3], as soon as enough people with high social influence [27] adopt a social norm, a tipping point [28, 29] is reached. The idea of a tipping point for environmental sustainability is used by Kinzig and colleagues [3] and derives from theoretical works [30] about the role that committed agents have in reaching consensus. In particular the value of 10% of committed agents - as a critical value for opinion diffusion - has been introduced by Xie and colleagues [30].

The tipping point is the critical point in an evolving situation that leads to a new and irreversible development. It takes place, making the norm widely shared and the corresponding behaviours pervasive. In our system the agents that are "consistent and inflexible" in their beliefs" are the active ones and the evangelists, i.e. the green agents, but also the blinds. In SAM4SN this notion is specialized and the sustainability tipping point (STP) is defined.

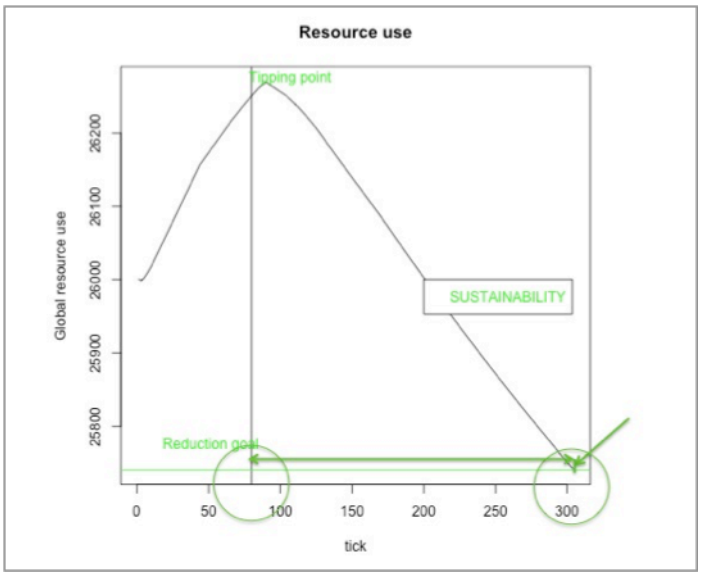

Fig. 4. Sustainability Tipping Point is reached before the reduction goal

Looking at situations evolving toward sustainability, we can observe, as the sustainability tipping point is reached much earlier than the overall reduction goal as showed in Fig. 4. If we can consider the reaching of the reduction goal as a long-term effect of a sustainability social norm, STP could be seen as an "early warning" signal, able to anticipate the reaching of sustainability. STP can be a sustainability indicator. In our case it corresponds to know "how early" the STP becomes true before the system reaches the sustainability (i.e. the reduction goal).

5 Conclusions

The STP could help in estimating "if and how long after" a given target will be reached. STP can help decision makers to establish the initial configuration of different types of agent leading to sustainability. To consider the initial commitment of agents as a constraint to reach an overall objective can be an approach for several kind of campaigns or initiative based on social norm effects.

A decision maker can pivot on that idea, for example, in pilot programs to support group of people to become more proactive and committed on a given cause. On the opposite he can evaluate that a strong initial commitment against such cause will counter any effort toward it. In policy-making it can be useful to better distribute effort and resources in environmental sustainability programs, while for a utility company the STP can be valuable to predict trends of decrease in resource consumption.

STP can be an useful tool for policy makers to better understand, for example, the areas of a political intervention where to allocate more resources or less resources. The sustainability tipping point can give decision makers a support to understand if a sustainability social norm is emerging in a given area.

SAM4SN can be used as a virtual laboratory where to perform experiments on such mechanisms and concepts. For utility companies, it could be a useful tool to explore how and when to invest on smart metering functions development.

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Semantic Business Process Model adapted for the JBoss jBPM Platform

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Abstract. Semantic technologies, and particularly those related to the Semantic Web and Ontology, are a very promising approach to cope with open issues in Business Process Management and in particular to improve automatic management and execution of business process. This paper presents a concept of semantic business process management applied to the eGovernment domain which improves the execution of the BPM by taking into account the context of the citizen who is asking for a service. The prototype developed to validate the proposed approach is an extension of the jBPM-JBoss platform, and it is compliant with the BPMN 2.0 standard.

Keywords: Semantic BPM; BPMN 2.0; JBoss jBPM; eGovernment

1 Introduction

Business Process Management is gaining attention in the e-Government domain in order to help public administrations to better cope with the increasing complexity of their processes and to deliver more efficient and effective services. Business Process Management (BPM) is defined by Van der Aalst as "supporting business processes using methods, techniques and software to design, enact, control and analyze operational processes involving humans, organizations, applications, documents and other sources of information"[1]. Business Process Management is usually supported by Business Process Modeling Notation (BPMN), a standard representation used to model business process flows. The first versions of the standard, up to BPMN 1.2, were purely graphical representations of the process flow that could not be directly executed. BPMN 2.0, released in 2011, represents a big steps forward towards increasing automation of process management and execution. Indeed BPMN 2.0 can be serialized in XML format and can be directly interpret by a BPM engine.

However with the increasing complexity of e-Government processes and services, traditional Business Process Management, which still requires significant human

labor, cannot satisfy today need for improving competitiveness of public administrations to provide better public services at lower costs.

Semantic Business Process Management is emerging as a new research area which combines semantic web technologies and Business Process Management to increase efficiency and effectiveness of services and better meet the need of citizens and businesses.

2 State of the Art

Semantic technologies, and particularly those related to the Semantic Web and Ontology, are a very promising approach to cope with open issues in Business Process Management and in particular to improve automatic management and execution of business process. Despite this fact, semantic business process management remains still largely unexplored and only few works are exploring how semantic technologies can help addressing open issues in Business Process Management. Among these works, one article[2] presents the importance of specific features on an Ontology in Modeling Work-flow Management Systems. The work of Bucchiarone[3] proposes a framework supporting context-aware evolution of business processes based on process instance execution and adaptation history. The work of Liu[4] proposes a theoretical framework for semantic business process management for e-Government applications.

The Semantic Business Process Management aims at automatizing the Business Process Management life cycle with the use of semantics and Semantic Web services technologies. One of the most important elements of process description, namely organizational ontologies, consists in proposing the creation of a context ontology made up of two distinct groups of ontologies: Domain Ontologies and Organizational Ontologies[5].

Other works, such as the work of Najar and Souveyet[6], are more focused on the semantic representation of a context model. The context-aware system uses context models in order to precisely define and formalize what a context is for a particular application (the notion of context and related relevant information differs from a domain to another and depends on the effective use of this information[7]). Once again, the context is decomposed in several parts called spheres of context observation. It is possible to provide with an upper context ontology that captures general concepts about basic context, and also provides extensibility for adding domain-specific ontologies in a hierarchical manner [8].

Based on the state of the art analysis presented above, in our project we have designed and developed a Context Ontology which represents the context of the user and that it is used to infer important knowledge during the execution of the business process.

3 Architecture

The Figure 1 below shows the global architecture of our semantic BPM prototype. These business processes can be translated into their semantic representation (SemanticBPM) using the BPMN 2.0 to Business Ontology translator

(Business Ontology translator is made by conversion the BPMN 2.0 after the Application Designed BPM and allows to store the ontology on a semantic format). When the user asks for a service, the corresponding SemanticBPM is retrieved. At the same time the user Context Ontology is filled in using data coming from the different social networks (the user has to enable the automatic retrieval of information from social networks) which are converted in RDF format and stored.

The Context Inference Engine uses the data in the Context Ontology and the SemanticBPM to infer relevant information to personalize the SemanticBPM (i.e. it allow to instantiate only the BPMN parts of the general business process needed by the user for the user - the proposed BPM is customized for a specific user context). This customization is done using pre-established rules. This personalized business process will then be executed and displayed to the user via the JBoss jBPM. During the execution of the personalized business process, the data of the Context Ontology are also used to automatically fill in, as much as possible, the forms. Additional information that is required, and that is not available in the Context Ontology, it is filled in by the user. This information will be recorded in a semantic database according to specific conversion rules (rules are defined using a semantic notation).

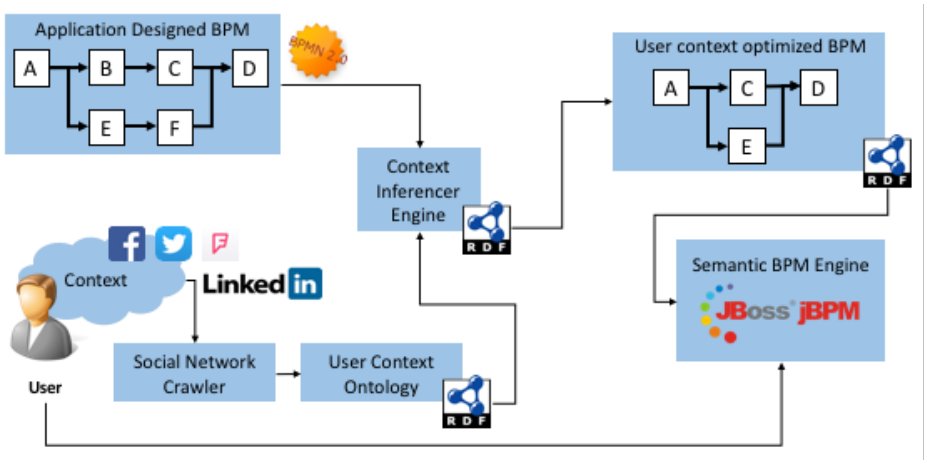

Fig. 1. Global Architecture Schema

Several modules are required for the implementation of this system, which are described in the next following points.

3.1. Social Network Crawlers

As the administrative processes and forms take into account the specificities of each person and for every request, they are often complex. To assist the user when filling a new form, the system offers the possibility to define a "user-context" using the information available on the Internet. This user-context will assist the user by pre-entering data or by making automatic decision of BPM choices. Information comes from social networks (through APIs provided by Facebook, Twitter, Foursquare and LinkedIn). It is possible to extend this context ontology using other sources.

3.2. User Context Ontology

This is a particular ontology used to structure and record the information extracted from the Social Network Crawlers module. To make it more flexible, it was decided to set up a multi-level ontology. This allows for a case to reuse part of the generic concepts already contained in it (for example, the basic information related to a person: name and surname). The instances of this ontology will therefore be recorded in a triple store.

3.3. Context Inference Engine

This part uses as input the full BPM converted to RDF and the context of the user. The system is using inferences (semantic rules between the context and the selected BPM) and generates a new BPM. This new BPM is customized and optimized for the specific user.

3.4. User context optimized BPM

This is the result obtained by the context engine. This is a new BPM adapted and optimized for a particular user context. This is the BPM that is executed when the user asks for a service by filling in a specific administrative form. The changes between the use of non-optimized BPM and the complete BPM can be significant. The objective is to simplify the BPM. Several parts of the form will be skipped and only the forms needed by the user will be shown to him.

3.5. Semantic BPM Engine

The last step is the execution of the BPM optimized for the user. This has been done by extending the jBPM platform to make it able to execute our personalized BPM. The data produced by the BPM will also be recorded in RDF format and stored in a triple store.

4 JBoss jBPM Adaptations

The JBoss jBPM Framework is the engine for the business process management. However, the design and running of processes are made through a workbench. The workbench is a Java web application known as KIE workbench.

4.1. Concept and Generic Use Case

Our proposed solution separates the design of the business process and the definition of the rules which allow to convert data forms into RDF triples. This separation allows to design the business process normally without thinking of how data will be transformed in RDF. Firstly, a business process is created with jBPM workbench by a designer which does not necessarily have knowledge of semantic web. After the initial modeling of the business process, a designer, with knowledge of semantic web, defines rules expressed in RDF by using determined ontologies.

The rules triples define how the data contained in the business process have to be expressed using semantic web technologies. The common attribute used for the conversion is the field name of each form which has to be a unique identifier per business process.

After the design of a BPMN 2.0 business process using a unique identifier for field names and a set of rules in RDF expressed with known ontologies, the process can be launched. An end-user fill data in forms and ultimately data are seamlessly stored into a semantic web store. Then semantic web data contained in the store engine can be queried through SPARQL language. The set of rules for a concept are regrouped in a RDF file using Notation3 for triples.

4.2. Logic Adaptation

In order to extend the default behavior of jBPM and store data from forms, it is necessary to define a custom field type. The custom type allows to implement custom behavior during the processing of those fields. Indeed, during submission of a form the values will be handled by a custom strategy which will implement the conversion of fields into RDF triples according to the rules. For each field of the form, a corresponding custom object will be created. The custom object will save the value of the field and all the RDF triples created after applying the rules.

The process of loading the rules and creating RDF triples is done in the getValue() method which is present in the interface CustomFieldType. This method is called with values of the form and has to return an object representing a specific field. For each field, a custom object is returned, and contains all necessary information for the creation of RDF triples (or triples directly). At some point afterwards, jBPM will request the fields to be persisted and our custom marshalling strategy will persist our custom object and push the corresponding triples to a RDF endpoint.

Thus, in order to be handled by our custom persistence, each field has to be created as a custom field during the design of the business process.

5 Validation of the Proof-of-Concept

This section presents a real use case. The different phases of the realization of the use case are explained and validate the concepts presented in previous chapters.

The validation is based on the AVS business process defined by the Swiss Federal Administration.

5.1. The AVS BPM

The figures 2 and 3 present the graphical view of the final AVS business process. The process is made of tasks which guide the user through the process. At each step he has to fill a form with data. Some data input is used for selecting the right branch of the process, according to the business logic. For example, the relationship status is used for branching and gather more information about a partner in case of an existing relationship. All the data filled by the user will be stored in the semantic web back-end. The user will not be aware nor has to care about the transformation into RDF triples.

In figure 4 each task is a user task, which means that a form is generated and the user will enter data for each of them. For example, in Identity task the user has to input several basic information about himself. The process contains several branchings, which are the different possible paths followed by the user according to previous entered data. For example, during Identity task the user will enter his relationship status, i.e. whether he is single or not. This information is used in several branchings in order to handle the two different cases. The majority of the branches are yes/no decision based on a question answered by the user. After the user went through all the tasks the process ends (red bullet).

5.2. Design of the business process

The business process is built with the KIE workbench which is shipped with jBPM. The workbench allows to create the full business process and generate forms for user tasks. The designer of the business process does not need to have extended knowledge of how the data will be converted into RDF triples and thus can use the workbench normally. However, he has to apply the following principles in accordance with the designer of the rules of conversion:

1. Use of custom fields for all fields which will be converted into RDF triples
2. Specify a parameter for the custom field which identify the set of rules
3. Use a unique name for each field to be converted throughout the process

Figure 4 demonstrates the design of a user task form which apply those principles. The field name identity_avs is unique for the AVS process and will be used to write rules of conversion for RDF.

5.3. Design of the user context optimized BPM

The specialized context realized for the AVS Application Case is presented on the Figure 5 and 6. The Person class must be the central element. This is the most important class in this ontology because the person is responsible for bringing the citizens related data.

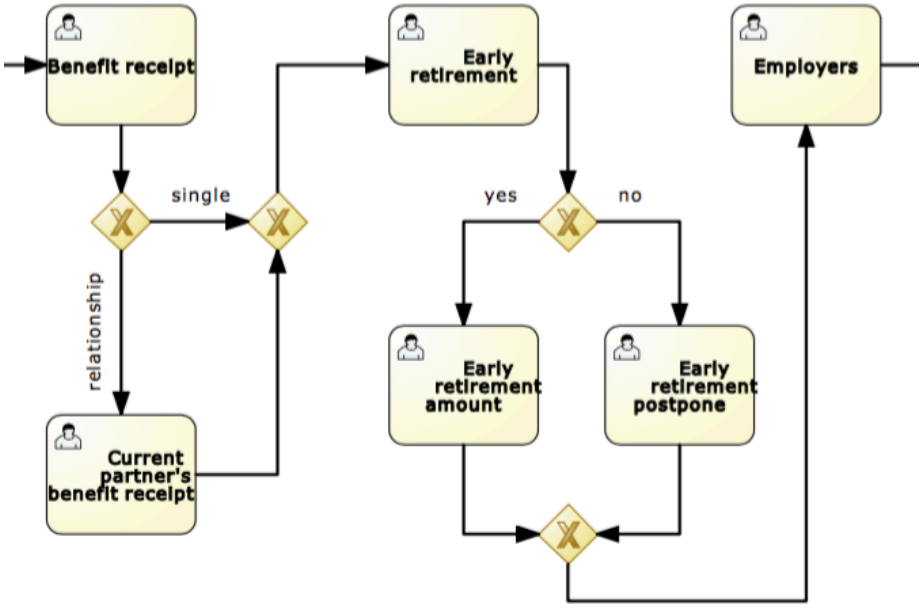

Fig. 2. BPM AVS (a) - We choose to present the most interesting part of the BPM, the initialization and the first step of the BPM AVS concerning the general question about the family composition and the practiced activities during all the citizen life are omitting. The steps presented of this figure concerns specific information about the partner and detail on all the last jobs. The BPM continues at the figure 3.

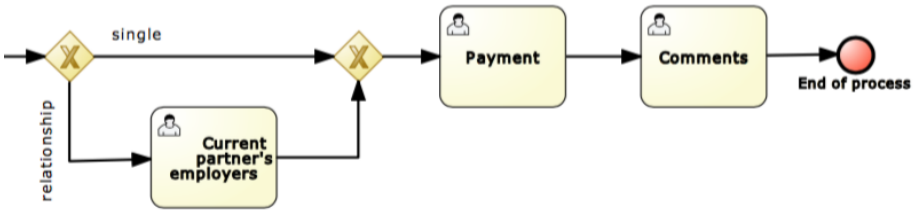

Fig. 3. BPM AVS (b) - This is the last steps for the modeling AVS application form. It concerns the partner jobs (present and past) and to finish the payment method of the AVS income.

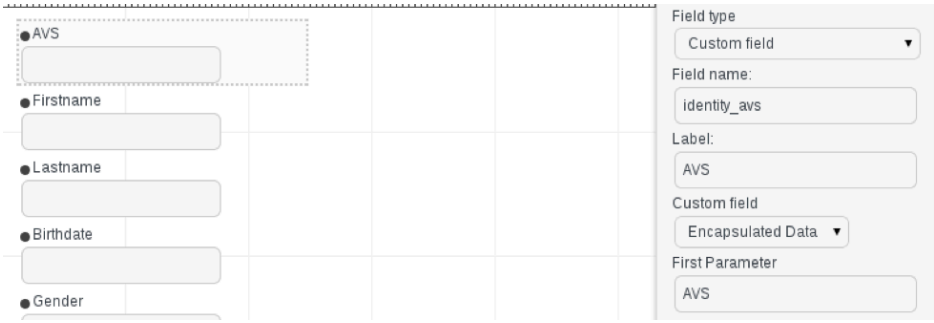

Fig. 4. Design of a form applying principles for RDF conversion - JBoss is composed a BPM designer. We choose to use this to modeling our BPM processing. For adding our semantic part, we create new custom fields. This new custom fields can encapsulate semantic information.

In this class are derived from others: PersonneCelibataire, PersonneNonCelibataire, PersonneConcernee, InsuredPerson, PersonneCurateur, PersonneEmployeur and PersonneEnfant. PersonneConcernee is the class that contains information common to the applicant user and his partner, if any, such as the different jobs that a person could have. The PersonneMariee class inherits from the class PersonneNonCelibataire. Only PersonneNonCelibataire can have former marriages/ partnerships, while PersoneCelibataire represents a citizen that has always been single.

Finally, period consists of a start date and an optional end date (if the end is not yet arrived). PeriodeEmployeur, PeriodeEtat and PeriodeEtudes are periods which we have added respectively information on employer, status and education.

5.4. Conversion Rules Definition

A set of rules is created corresponding to this business process and are stored in a file AVS˙rules.rdf. The rules define for each field a subject and predicate. For example, at the identity task an AVS number is request by identity_avs field which identifies a person. In RDF, the following rules are stated:

fd:identity_avs ru:hasPredicate "hasAVSNumber"

fd:identity_avs ru:hasSubject fd:identity_avs

According to those rules, if a user enters a value 1133 inside identity˙avs field, the following RDF triple will be created:

eiafr:1133 eiafr:hasAVSNumber "1133"

Data Properties Conversion The first name of a person is entered is the field identity first name and can be linked to the correct person with the following statements:

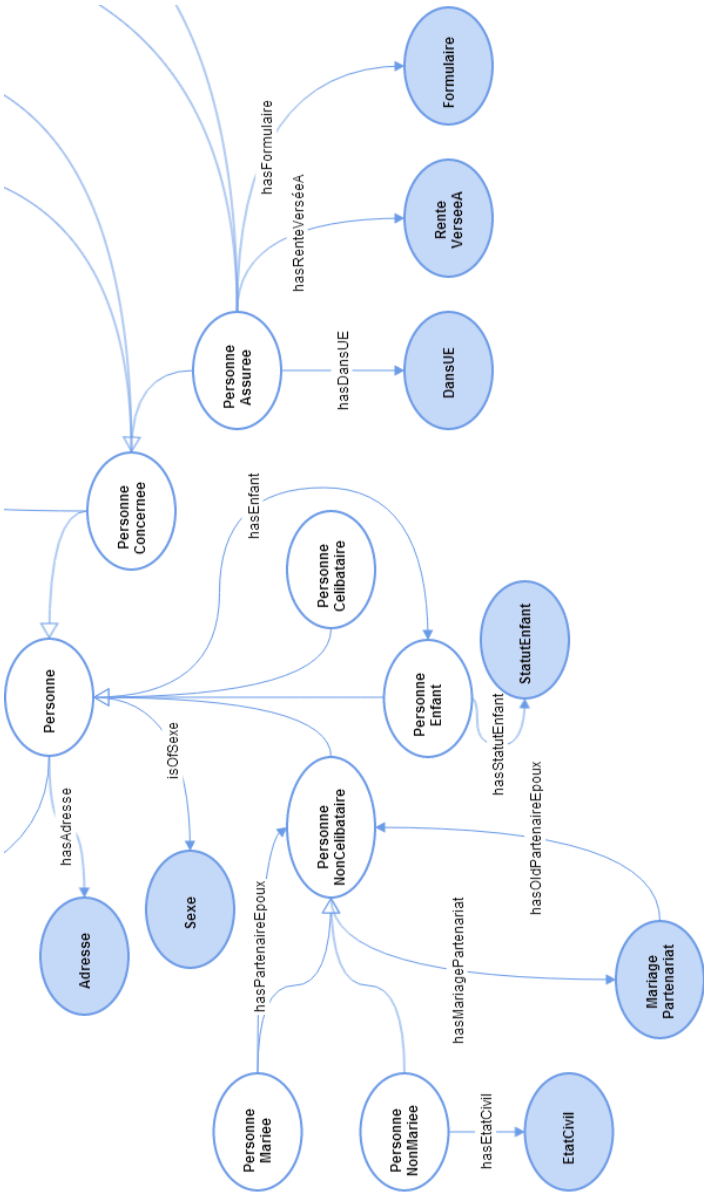

Fig. 5. Schema of the created AVS Ontology Process (Person part). This schema is the ontology representation of the AVS application form provided by the Swiss administration. This part concerns only the modeling of the relations with people present on the AVS form - mainly the family composition. Note that in this representation we see only the classes and properties that connect them (Classes and Object Properties). Class attributes therefore do not appear (Data Properties).

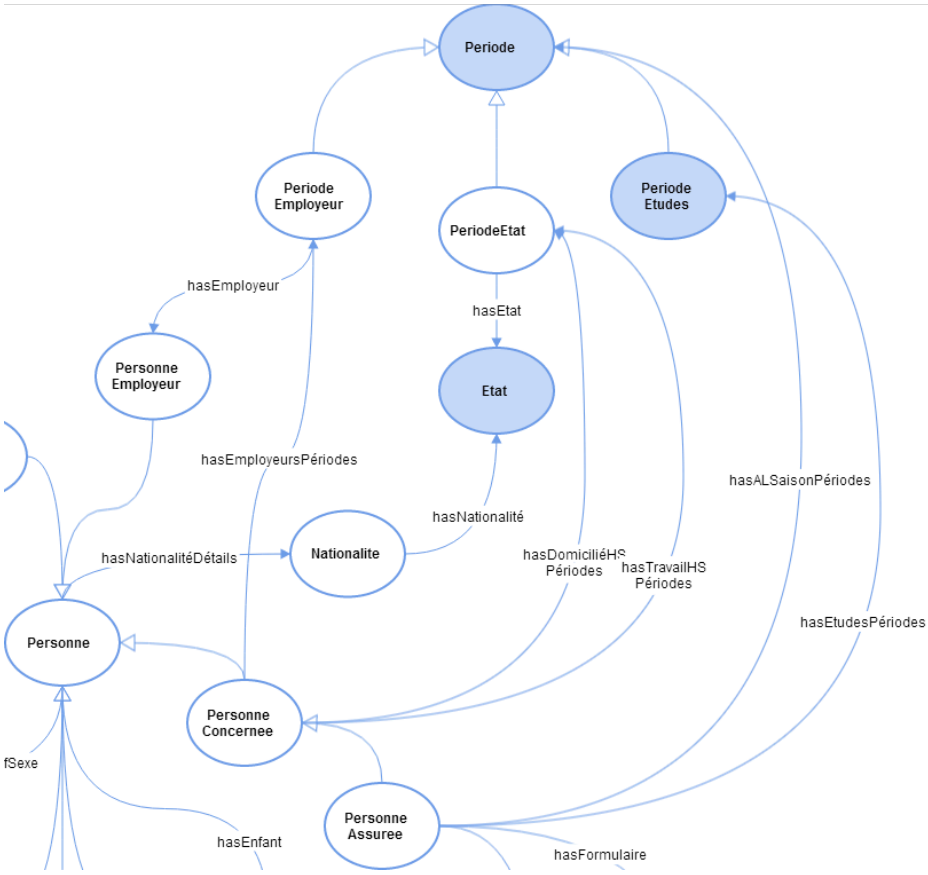

Fig. 6. Schema of the created AVS Ontology Process (Period part). This part concerns the modeling of the period in relation to the work activities and nationalities.

fd:identity _firstname ru:hasPredicate "hasFirstname"
fd:identity firstname ru:hasSubject fd:identity avs

According to those rules, if a user enters the value Jon in the field identity first name, the resulting triple is:

eiafr:1133 eiafr:hasFirstname "Jon"

Object Properties Conversion or this business process two relations are declared: partner and parent. Partner identifies two persons which are in marital relationship. Parent identifies a child-parent relation between a child and his parents. Those two rules are defined as follows:

fd:partner_avs ru:hasRelation rl:partner
rl:partner ru:hasObject fd:identity_avs
rl:partner ru:hasPredicate "hasPartner"
fd:child_avs ru:hasRelation rl:parent
rl:parent ru:hasObject fd:identity_avs
rl:parent ru:hasPredicate "hasParent"

fd:partner_avs is the field which contains the AVS number of a partner and fd:identity_avs contains the AVS number of the person filling the business pro- cess. Following triples are examples of the result of this two rules:

eiafr:888 eiafr:hasPartner eiafr:1133
eiafr:555 eiafr:hasParent eiafr:1133

5.5. Form Execution

The Figure 7 presents the full form of the identity task of the AVS business process. The form of the identity task filled with example values

The triples generated from the form filled in the Figure 7 are the following:

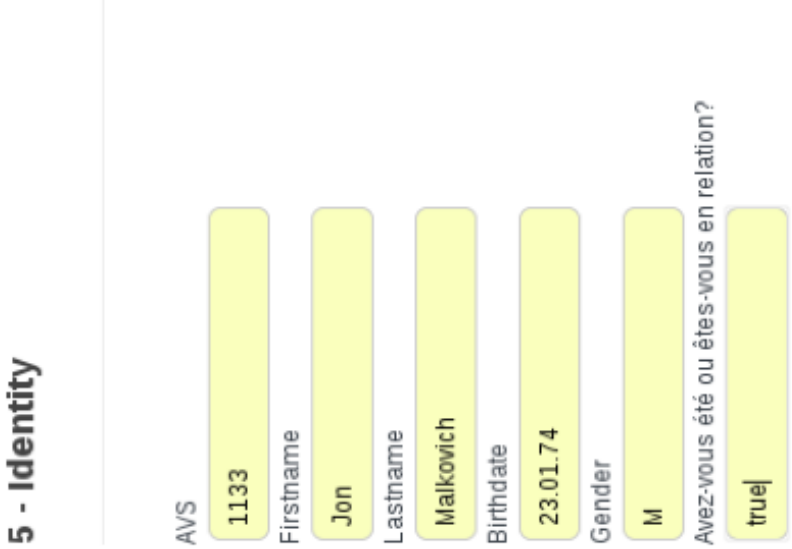

Fig. 7. Design of a form applying principles for RDF conversion

eiafr:1133 eiafr:hasAVSNumber "1133"
eiafr:1133 eiafr:hasBirthdate "23.01.74"
eiafr:1133 eiafr:hasGender "M"
eiafr:1133 eiafr:hasFirstname "Jon"
eiafr:1133 eiafr:hasLastname "Malkovich"
eiafr:1133 eiafr:isInRelationship "true"

Triples are stored in the RDF store as soon as the form is submitted by the user.

6 Discussions and Conclusion

This paper presents the work done to develop a semantic BPM engine. The developed prototype is based on JBoss jBPM platform which is an open source software for

editing and executing business process described with the standard BPMN 2.0. Our prototype extends the platform to make it possible to execute business process modeled using a semantic description compatible with BPMN 2.0. The developed prototype has been tested with the "AVS Application process" use case.

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