Proceedings of the 12th Israel Association for Information Systems (ILAIS) Conference
June 18, 2018

SCE - Sami Shamoon College of Engineering
Ashdod, Israel

Conference Co-Chairs:
Adi Katz, Ronit Shmallo, Tsiпи Heart

The Israel Association for Information Systems (ILAIS) was founded in 2005 as the Israeli chapter of the Association for Information Systems (AIS). The goal of ILAIS is to promote the exchange of ideas, experiences and knowledge among IS scholars and professionals engaged in IS development, management and use.
Preface

This volume contains the papers presented at ILAIS 2018: ILAIS 2018 - the 12th Israel Association for Information Systems Conference held on June 18, 2018 in SCE Ashdod.

There were 24 submissions. Each submission was reviewed by at least 2 program committee members. The committee decided to accept 23 papers.

Great thanks to all authors and presenters for sharing your interesting research, knowledge, experience and thoughts and for your significant contribution to the event.

Great thanks to all the students who came to share their wonderful final projects at the poster session.

Great thanks to Dr. Ofir Ben-Assuli for your outstanding organization of the Industrial session. It was great working with you!

Great thanks to ILAIS2018 keynote speakers: Dr. Vered Pnueli, Head of Digital Media, Shenkar College and Mr. Moshe Sadeh, Head of the Computerization and Information Systems Division, Clalit Health Services. Great thanks to ILAIS2018 industry session speakers: Raz Heiferman (Be Digital), Motti Sadovsky (DCS-IT), and Gal Inbar (iCobots). Thank you each so much for the time, the effort, and especially for such interesting talks and demonstrations that let us in to your fascinating worlds of IT.

Great thanks to ILAIS2018 PC members, who read the submissions and gave constructive feedback. Thank you for your time and help!

Great thanks to those who were not PC members, but nevertheless volunteered to assist in the reviewing of the remaining submissions, in such a short time. We appreciate it very much.

Great thanks to ILAIS2018 parallel session chairs: Dr. Adir Even, Dr. Eleanor Eytam, Dr. Noa Regonis, Dr. Dizza Beimel and Dr. Irena Milstein. Thank you for your time and help!

Great thanks to Prof. David Schwartz, Prof. Dov Te‘eni, Dr. Dizza Beimel and Dr. Ruti Gafni, for answering every question and concern, for your advice and for distribution the many emails we sent.

Great thanks to Dr. Nitza Geri for uploading the conference content to ILAIS website.

And last but not least:

Great thanks to everyone who came to ILAIS2018! It was wonderful seeing you all!

July 16, 2018

Adi Katz
Tsipi Heart
Ronit Shmallo
## Program Committee

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Keyword Index

activity diagram
adoption of information systems
Agile
algorithm
AR
Augmented Reality
automation
bias
big data
big data analytics
BPMN
business process modeling
Cargo Handling
CHF
COBIT
competencies
Computer Assisted Language Learning
conceptual modelling
conceptual schema
Congestive heart failure
CRISP-DM model
crowdsourcing
Cyber incident
data analytics
Data Mining
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driver behavior
driving incidents
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education
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graph database

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heart failure
HIF
human computer interaction (HCI)
IRD
information evaluation
information peer-production
Information production
information Systems Education
Information systems development
intelligent gamification
internal control
IT control deficiencies
language learning
language learning systems
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Politeness
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Productivity
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qualitative research
Qualitative Study
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Keyword Index

Service Standards
smartphone-based community
social computing
Social Media
social media
Social Networks
Social Norms
Software testing
Spaced Repetition
Students' Perspective
test cases
Text Mining
Theory of IT controls
topic detection
Twitter

User Effort
User model
User Relations
user stories
User-IT Communication
Users

virtual lab

Wellbeing
Wisdom of the Crowd
works system theory
WST
12th ILAIS Conference  
June 18, 2018  
SCE - Sami Shamoon College of Engineering, Ashdod

9:00 – 9:30 Gathering, registration & coffee

9:30 - 9:45 Welcome session (Auditorium 110)
Conference Chairs: Dr. Adi Katz, Dr. Ronit Shmallo, Dr. Tsiipi Heart. Opening greetings
Secretary of ILAIS: Dr. Dizza Beimel, Ruppin Academic Center
Dean of the Faculty of Engineering: Prof. Shlomo Mark, SCE Ashdod Campus

9:45 - 10:25 Keynote (Auditorium 110)
Dr. Vered Pnueli, Head of Digital Media, Shenkar College:
“Positive Game Design for Subjective Wellbeing”

10:30 - 11:50 Parallel paper sessions

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Rina Zviel-Girshin, Branislav Bedi and Nathan Rosenberg | Perception of Social Norms Violation in Shared Augmented Reality  
Lev Poretski, Joel Lanir and Ofer Arazy |
| 10:50-11:10 | IT Control Deficiencies as Precursors of Cyber Incidents: Theory Development and Empirical Examination  
Michel Benaroch | Crowdsourcing Privacy Design Evaluation  
Oshrat Ayalon and Eran Toch |
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<td>The Effects of a Mobile App on Driver Behavior in an Organizational Setting</td>
<td>Michal Levi-Bwiech, Polina Kurtser, Nava Pliskin and Lior Fink</td>
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<td>Topic Authenticity Measurement</td>
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11:50 - 12:05 Coffee break (Auditorium 110 hall)

12:05 - 13:25 Parallel paper sessions

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<td>Willingness to Join a Smartphone-Based Emergency Response Community – Evidence from a Field Study Michael Khalemsky, David Schwartz, Tamar Silberg, Anna Khalemsky, Eli Jaffe and Raphael Herbst</td>
<td>Data Mining Implementations: Multiprocessor Architecture vs. Hadoop Distributed Computing Architecture Dror Ben Ami</td>
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12:35-12:50 The Information Content of Multi-Word #Hashtags
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13:25 - 14:15 Poster presentations and lunch (Rooms 167, 168, respectively)

14:15 - 15:15 Industry session, (Auditorium 110)
Organizer and Chair: Ofir Ben-Assuli

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Data - the Oil of the Digital Era

14:35 Motti Sadovsky, DCS-IT
From IOT Data to Qualified Business Decisions

14:55 Gal Inbar, iCobots
Teaching Collaborative Robots and Nurturing their Behavior Trees

15:15 - 15:55 Keynote (Auditorium 110)
Mr. Moshe Sadeh, Head of the Computerization and Information Systems Division, Clalit Health Services “Digital Health as Practiced at Clalit: A Disruptive or Evolutionary Innovation?”

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16:15 - 17:15 Open ILAIS planning meeting – all are welcome to join (Room 168)
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1. Enetcollect User Model for Intelligent Gamification Crowdsourcing Language Learning IS, Rina Zviel-Girshin, Branislav Bedi and Nathan Rosenberg

2. IT Control Deficiencies as Precursors of Cyber Incidents: Theory Development and Empirical Examination, Michel Benaroch


4. The Effects of a Mobile App on Driver Behavior in an Organizational Setting, Michal Levi-Bliech, Polina Kurtser, Nava Pliskin and Lior Fink
ENETCOLLECT USER MODEL FOR INTELLIGENT GAMIFICATION CROWDSOURCING LANGUAGE LEARNING IS

Complete Research

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Keywords: User model, intelligent gamification, edutainment, crowdsourcing, language learning

1 Introduction

The enetCollect (European Network for the Combination of Language Learning and Crowdsourcing Techniques) is an action funded by the COST\(^1\) programme. It addresses the major European challenge of fostering language skills of all citizens regardless of their diversified social, educational, and linguistic backgrounds. To this end, the Action has been concerned with the domain of Language Learning. Its focus is to enhance the production of learning material by crowdsourcing in order to cope with both the possible increase for learning foreign/second language due to migration, business and tourism, and the demand for more accessible materials in many languages that are of interests to various learners. EnetCollect addresses this challenge by performing the groundwork to set into motion a Research and Innovation (R&I) trend combining the well-established domain of Language Learning with recent and successful crowdsourcing approaches in order to unlock a crowdsourcing potential available for all languages and trigger an innovation breakthrough for the production of language learning material and language-related datasets. This objective is being approached by building an international and interdisciplinary R&I community, creating a comprehensive theoretical framework and running prototypical experiments, while bearing in mind the striking diversification of learner profiles and their needs. In this context, a befitting User Model (UM) with intelligent gamification elements plays a very important role.

The article structure is as follows. We present the requirements for enetCollect IS, such as edutainment, gamification, computer assistance and a smart User Interface (UI). The first requirement for implementation is a UM. We propose a 3-level UM (ID, EGO, SUPER-EGO). The a-priory tier of Initial Data about user is before any individual feedback. Therefore the ID stage requires researching the empirical and theoretical data about typical user. We reviewed the literature and propose such an ID UM. After feedback is available the UM will evolve along the higher tiers using AI crowdsourcing methods.

\(^1\) COST (European Cooperation in Science and Technology) [http://www.cost.eu](http://www.cost.eu)
2 Edutainment

The preferred style of learning today is edutainment. Edutainment is a compound word associated with terms of education and entertainment (Hildmannand and Hildmann, 2011). It was defined in the 1980’s as “the use of entertainment devices or activities to teach school-based and education subjects or concepts” (Gerber, 2014) and first coined by Trip Hawkins, the founder of Electronic Arts, and used in the context of computer games and education (Becker and Parker, 2012). It represents a hybrid genre relying on visual material, narrative and game-like formats, and a less didactic style of address (Okan, 2003).

2.1 Gamification

Edutainment is often associated with game-based learning, which uses game elements, or gamification, to entertain users when playing computer games for educational purposes. Even thou these terms edutainment, gamification and game-based learning often occur together, they are three independent concepts that inform one another. For instance, gamification is a system of features used within the design of a product, e.g., a computer game, which can occur in a game-based learning approach (Gerber, 2014). In the combination with education and entertainment, the computer game acts as an edutainment product, which can be used for teaching various subjects such as math or languages at schools or outside of the traditional classes.

3 Computer Assisted Language Learning

In the context of Computer Assisted Language Learning (CALL), the purpose of gamification is to apply a specific pedagogical strategy to engage and empower learners’ motivational skills toward learning another language (L2) (Flores, 2015). While keeping the learners entertained, this strategy may motivate them towards further solving tasks and thus enhance learning. This is especially important in blended learning, in which the learner combines the opportunity of face-to-face learning with a tutor with the opportunities of the online environment on an individual basis (Hew and Cheung, 2014). During the individual part of learning, it is important to keep the learner motivated. This can be done, for instance, by enriching educational applications or online learning platforms for features of gamification. The effectiveness of these features, however, depends on the context in which they are implemented as well as on the users using it (Hamari et al., 2014). Therefore, UIs of such applications or platforms.

4 Gamified Crowdsourcing AI Language Learning IS

G-CALL-IS – Gamified Crowdsourcing AI Language Learning Information System is a network architecture of servers, knowledge bases, linguists, educator experts, content providers, teachers and prosumers (the student being both producer and consumer) of learning material.

G-CALL-IS integrates into one extremely powerful IS the major tools and most useful methods of:

- gamifying
- crowdsourcing
- AI
- Language Learning educational and linguistic knowledge
G-CALL-IS is the holy grail of current research and development. It includes both intelligent architecture and intelligent life-cycle.

5 User Interface

User interfaces (UIs) in educational applications that include elements of gamification can lead to a better learning experience. This article talks about important features that need to be considered when designing an educational application, which supports individual learning. The focus here is on elements of gamification and user choices, leading to a more personalized UI and a better learning experience.

The basis of G-CALL IS, as in any IS, is the User Model (UM). The UM for LL (UMLL) is crucial for G-CALL-IS. The initial, a-priory, most general, default UMLL, are vital for G-CALL-IS as they enable the first stages of its design and operation. As the IS becomes operational, through use and crowdsourcing the UMLL is refined and constantly evolving. We define a three tier UMLL life-cycle and analyse in great detail (including an extensive literature review) the crucial first tier.

6 User Model for Learning Languages IS (UM LL-IS)

User Model for Language Learning (UMLL) for enetCollect G-CALL-IS was built as a three-tier framework (echoing but not identical to Freud’s ontology).

1. ID

Initial Data (ID)– empirical and theoretical research allowing us the a-priori basic most general primitive assumptions about the user.

2. EGO

Enquiry and Game Outcomes or Enquiry Generated Outcomes (EGO). Personal individual data acquired through explicit and implicit feedback. Both subjective and objective data and knowledge about the individual user.

3. SUPER-EGO

The group or crowd generated data (crowdsourcing). The different groups relative to the user could be as large as all users anywhere anytime or as small as his immediate family of best friend or anywhere in between. It applies to the individual user because of his memberships in the various groups.

ID UMLL

First we build the ID UMLL. It was found empirically that the two first characteristics of the user to be considered a-priory are age and gender (Romrell, 2013; Prescott & Bogg, 2014; Romero et al., 2017). One such basic trait is age with differences between: children (Amory and Molomo, 2012; Zviel-Girshin, 2013) young adults/teenagers and adults (Romrell, 2013).

Many games are gender-stereotyped (Connolly, 2009; Carr, 2007). Some games favour one gender (Chang et al., 2009), but preferences often do differ between girls and boys.

The most basic model of the user is as a point in 2D plain. One coordinate is the age another is the gender. Those two are the initial independent variables. Until no other data is available the G-CALL-IS
can be described as a 3D space where the z-coordinate is the dependable variable of the data relevant to the user. The data could be the first game to propose to the user, the choice of the first learning material, the first question to ask etc.

7 Conclusions and Future Research

After the user model and content infrastructure are initially analysed and designed, AI mechanisms for learning, feedback and evolution will be added for a better enetCollect. With crowdsourcing, the process of learning and the process of creating content and improving the IS are the same. In many instances the learner becomes a prosumer (both producer and consumer, often simultaneously) of the content of the IS.

There is a G-CALL enetCollect life cycle of building and refining the model and process constantly to produce an evolving ever improving knowledge base of IS. To implement the G-CALL enetCollect learning based on the modelling we will develop mechanisms for data gathering, processing and learning complementing the data in the knowledge base.

The enetCollect UMLL presented here will serve as the basis and starting point for numerous burgeoning language learning solutions.

This research was funded by COST action enetCollect CA16105. We thank Lionel Nicolas, Verena Lyding, Corina Forascu and Magali Paquot for all the support and administration.

References


Zviel-Girshin, R. 2013. Exploring User Choices In Game-Based Educational Software For Kindergarten Children. ILAIS 2013, pp.91-96
PROPERTIES OF IT CONTROL DEFICIENCIES
AT THE ROOT OF CYBER INCIDENTS:
THEORETICAL AND EMPIRICAL EXAMINATION

Complete Research

Michel Benaroch, Syracuse University, Syracuse, NY, USA, mbenaroc@syr.edu

Keywords: Cyber incident, IT control deficiencies, IT control theory, COBIT, Network analysis, internal control.

1 Introduction

Building on research connecting cyber incidents with the oversight role of the board of directors over IT resources (Benaroch and Chernobai 2017), we seek to understand IT control deficiencies at the root of cyber incidents and their connection with board IT competence. IT control deficiencies are common causes or major contributory factors of system or security failures, according to information and cyber security frameworks (ISO/IEC27002 2012). Examples of IT control deficiencies are poor oversight over changes to IT systems, inadequate access rights to systems and data, and lack of IT continuity and recovery plans.

IT controls are management and technical policies, procedures, standards and organizational structures for exercising oversight over how IT resources in a firm are mobilized (ITGI 2007). COSO (2004), the de-facto standard for enterprise internal control, maps IT controls into three levels. Board-level IT controls set the control environment and monitor IT controls at lower levels (Benaroch and Chernobai 2017). Management-level IT controls, also called IT general controls, enable exercising oversight over firm-wide IT processes for acquiring, developing, implementing, maintaining, operating and delivering IT systems, IT services, and data assets. Application-level IT controls are automated and manual controls for ensuring that application-level transactions are complete, accurate, and authorized; application inputs and data edits meet integrity and validity tests; and so on.

We focus on IT controls at the management and board levels. When IT general controls are deficient, they could have a pervasive adverse effect on many IT resources. They are the target of internal audits since the benefits of monitoring are leveraged over all IT systems (Protiviti 2012). Board-level IT controls, of course, are important to setting the “tone at the top” and the importance IT management ascribes to IT general controls and remediation of their deficiencies.

2 Objectives

(A) Develop a theoretical model for representing a system of IT general controls and examining properties of those controls; and

(B) Empirically validate two assertions: (i) the pervasiveness and remediation difficulty of deficient IT controls at the root of cyber incidents influence the adverse stock market reaction to those incidents, and (ii) the IT competence level of the board moderates this influence.
3 Theoretical Underpinning

The rationale underlying our first assertion (hypothesis), concerning the pervasiveness and remediation difficulty of deficient IT general controls associated with cyber incidents, goes to the adverse effect of those IT controls on firm IT capability. IT capability is the firm’s ability to effectively mobilize and deploy IT resources in combination with other resources (Bharadwaj 2000). IT general controls are an integral part of firm IT capability. They enable IT management to exercise control over IT processes using which IT resources are acquired, developed, combined with business resources, tested, and deployed. The link between deficiencies in IT controls and firm IT capability weaknesses is apparent in early ERP implementations (Kumar et al. 2008).

The rationale for our second assertion (hypothesis), concerning the moderating role of board IT competence, goes to the oversight responsibility of boards over the effectiveness of IT general controls. Market investors care not only about the existence of pervasive control deficiencies but also about their remediation difficulty. Firms failing to remediate deficiencies in internal (non-IT) controls over financial reporting suffer a rise in cost of debt capital, pay higher audit fees, and miss reporting deadlines more often (Bedard et al. 2012). Nonetheless, firms may decide against, or just face difficulties remediating pervasive IT control deficiencies due to the complexity and effort involved (Protivity 2012). Remediation also depends on the board of directors having relevant knowledge and expertise. Accounting research reports that firms are more likely to remediate internal control deficiencies over financial reporting when they have more independent boards, audit committees with more non-accounting financial expertise, and CFOs who are Certified Public Accountants or have more accounting experience. By analogy, board IT competence is important to the remediation of IT control deficiencies. IT competent boards are more likely to shape IT management consciousness about IT general controls and remediation of their deficiencies as well as provide expertise in support of remediation.

4 Methods and Results

We develop theoretically and test empirically the link between: market reaction to cyber incidents, pervasiveness and remediation difficulty of associated IT control deficiencies, and board IT competence.

Lacking a theory of IT controls (Geerts et al. 2013), we develop a theoretical model for describing a system of IT controls, explaining what makes certain IT controls pervasive and difficult to remediate, and predicting consequences of pervasive IT control deficiencies. Our model builds on ontological meta-models and graph representations of internal (non-IT) controls in accounting ISs (Wand and Weber 1989; Krishnan et al. 2005; Guan and Levitan 2012). Our model contrasts sharply with taxonomies of controls that downplay the interactive complexity of IT controls (Li et al. 2012).

We test our hypotheses using a sample of 103 cyber incidents documented in a commercial database called FIRST. We map IT control deficiencies implicated in each cyber incident using COBIT, a widely used practice-oriented IT control framework covering all IT processes normally found in IT’s traditional responsibility areas (ITGI 2007). We assess the pervasiveness and remediation difficulty of implicated IT controls deficiencies based on input/output dependencies between IT controls. Our approach uses network analysis and the concepts of connectivity and centrality, taking into account
software and workflow process design literatures linking the degree of coupling of system elements to change difficulties, high error rates, and system-failure proneness (Selby and Basili 1991; Vanderfeesten et al. 2008; Cataldo et al. 2009; Bhattacharya et al. 2012). The analysis results support fully our research hypotheses.

5 Conclusion

We make three contributions to the IT literature. First, we draw attention to an area hardly studied in IT research that is of great interest to IT practitioners, markets, and regulators. Second, we develop a theoretical model of a system of IT general controls with a focus on controls’ interrelatedness. Third, we demonstrate the centrality of IT control deficiencies to the market reaction to cyber incidents, to investors’ perception of long-term IT capability weaknesses, and to the important connection with board IT competence.

References


ITGC. 2007. COBIT 4.1 Framework, IT Governance Institute, IL: Rolling Meadows.


DESIGN OF A GRAPH DATABASE SCHEMA

Complete Research

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Keywords: graph database, conceptual modelling, conceptual schema, ERD, NoSQL

1 Introduction

The evolution of the Web and the explosive growth of "big data" have placed new demands on database technology, bringing the relational model to its limits. What worked well for many years for structured data is not well suited for the unstructured massive amounts of data that are part of the Web and new Web applications, such as social networks. As a result new types of database have emerged, including NoSQL (“not only SQL”) databases.

The world of NoSQL databases is rapidly developing, but they still have many shortcomings that prevent users from adopting them and limit their use. One of these shortcomings is the lack of a database design methodology. Badia and Lemire claim that good database design is crucial to obtaining a sound database, and that further research is required in order for NoSQL to meet the needs of big data, unstructured data, imperfect data, and the like (Badia and Lemire, 2011). (Atzeni et al, 2013) claim that the need for logical data models in the NoSQL world is a central issue; it seems, they say, that NoSQL systems don’t distinguish between logical and physical schemata, which complicates the maintenance of the databases. NoSQL databases are considered schema-less, but data modelling and schema will always remain important (Kaur and Rani, 2013).

In this study we focus graph databases. Graph databases work well with interconnected data, i.e., data with many relationships (Angles, 2012; Robinson, Webber, and Eifrem, 2015). These databases provide an easy way to model relationships between different types of data, and they have many traversal algorithms that are helpful in finding relationships. The main components of a graph database are nodes and edges (relationships). Edges are usually directed, i.e., an edge has a start and end node. Nodes and edges have labels and may have properties. Graph databases have no schema; some claim that this provides more flexibility (Angles, 2012; Robinson, Webber, and Eifrem, 2015). However the flexibility associated with having no schema has drawbacks; without a schema, it is difficult to enforce integrity constraints. For example, a node in the database can be connected to any other node, regardless of whether it makes sense.

In (Roy-Hubara et al, 2017), we proposed a method for modelling graph databases. More specifically, we described a method for creating a schema for graph databases based on a conceptual schema of the domain of application. We use an ERD (Entity-Relationship Diagram) as the conceptual schema and provide a two-step process for mapping the ERD to a graph database schema (GDBS). This extended abstract summarizes that study.

2 Summary of the modelling method

Our modelling method of graph databases is based on an ERD, which is mapped to a graph database. Some constructs of the ERD cannot be mapped directly, and have to be converted to equivalent constructs of ERD before the actual mapping. Specifically, we refer to ternary relationships,
aggregation (whole-part) relationships, and inheritance (is-a) relationships. Hence, the method consists of two stages: in the first, we transform the initial ERD to an equivalent adjusted-ERD; in the second stage, we apply certain rules which map the adjusted-ERD to a graph database schema diagram, and define the schema using proper DDL statements.

2.1 Adjusting the ERD

A. A ternary relationship is mapped to a weak-entity, with binary relations to the entities involved in the ternary relation. If the relation has properties, they are added to the weak entity. The name of the weak entity may be identical to the name of the original ternary relationship, or be composed of the names of the involved entities, or be any name that resembles its role. If the ternary relation is n:n:n; the weak-entity has binary relationships with its three “strong” entities. In cases in which the ternary relation is n:n:1, the weak-entity would have two binary relationships with the "strong" entities which are on the "n" side of the ternary relationship, and an "ordinary" relationship with the entity on the "1" side.

B. An aggregation (whole-parts) relationship (e.g., a car is composed of an engine, wheels, gear, etc.) is mapped to an "ordinary" binary relationship, in which the cardinality of the "parts" entity is 0:n or 1:n (depending whether the parts entity is mandatory or not), while the cardinality of the "whole" entity is always 1:1.

C. An inheritance (is-a) relationship can be mapped in two different ways:

1) Method A: no change of the original entities:
   According to this method, the involved entities remain unchanged, but the ‘is-a’ relationships are mapped to "ordinary" binary relationships named “is-a” with cardinalities 1:1 next to each of the involved entities.

2) Method B: removing the inheritance relationships:
   According to this method, the inheritance relationships are removed and the super-type is merged with its sub-types. We distinguish between two possibilities:
   a) Removing the sub-type entities and moving their attributes and relationships up to the super-type entity, adding to it a new property named type. This mapping is applied when the inheritance relationship is not defined with the "T" (Total-cover) constraint, and/or not defined with “X” (Exclusive), meaning that there are super-types which are not one of the sub-types and/or that a super-type may belong to many sub-types. If this inheritance relationship does not have an “X” then the super-type's new property "type" will be defined as a "set", to allow it to contain more than one value.
   b) Removing the super-type entity and moving its properties and relationships to each of its sub-types. This mapping is applied when there are "T" and “X” constraint between the sub-types, meaning that all super-types belong to one sub-type only. Therefore, there is no need to maintain the super-type.

2.2 Mapping the adjusted-ERD to the graph database schema

The adjusted-ERD is mapped to a GDBS (graph database schema) diagram and an equivalent DDL. The mapping process is based on the following rules:

Mapping entities to nodes: Each entity is mapped to a node; the entity's properties become the node's properties. A weak-entity is mapped to a node just like an "ordinary" entity. The key property of this node is composed of the keys of the related "strong" entities, plus the partial key of the weak entity (if this exists).

In the GDBS diagram, a node is represented by a rectangle consisting of two parts: the upper (smaller) part includes the node label; the lower (larger) part includes the properties’ names.
**Mapping relationships to edges:** Each relationship between entities is mapped to an edge connecting the respective nodes. The edge's name may be the name of the relationship or be based on the roles of the connected nodes. In graph databases the edges are directed, distinguishing between start and end nodes of each edge. It does not matter which node is defined as the start node and which as the end node, because graph databases enables traversing from node to node in any direction (Robinson, Webber, and Eifrem, 2015).

In the GDBS diagram, an edge is represented by a line with an arrow head pointing from the start node to the end node. The edge name is written above/near the arrow.

**Mapping cardinality constraints:** To the best of our knowledge, current graph databases do not define cardinality constraints (i.e., the minimum and maximum number of nodes that may participate in an edge-type). For example, Neo4j (Angles, 2012), a leading graph database system, has not (yet) defined such constraints. We add cardinality constraints to edges, equivalent to such constraints in the ER model. We claim that it is important to include such constraints, because in some cases we want to limit the number of nodes that may be involved in an edge type. Examples of such constraints: a movie may have no less than 2 and no more than 10 actors; a user may rate a certain movie only once. The notation of cardinalities in the GDBS is exactly as in the ERD.

Figure 1 presents an example of a GDBS diagram generated from a certain ERD. (Due to space limit no explanations are provides.)

![Figure 1: Example of a GDBS diagram](image)

### 3 Summary

In (Roy-Hubara et al, 2017) we introduced a method to model graph databases using a rich ERD that represents a domain. The result is a diagram of the graph databases schema. In addition to the diagram, we define DDL statements of the schema, which can be added to a graph database system such as Neo4j. The DDL will enable to enforce integrity constraints that are defined in the users' requirements.

In further work, which is still in progress, we test and evaluate the proposed method. In one test, we compared the two possible mappings of an original ERD to an adjusted-ERD. In a comparative experiment, we compared three methods of creating a GDBS for a given requirements document: (a) a "control" method, where designers use "best practice" only; (b) ERD-only, where designers are also given an ERD of the domain; c) ERD + mapping rules, where in addition to (b) designers are also given the mapping rules. The results of the tests and experiments will be published separately.
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THE EFFECTS OF A MOBILE APP ON DRIVER BEHAVIOR IN AN ORGANIZATIONAL SETTING

Complete Research

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Keywords: mobile app, fleet-management, driving incidents, driver behavior

1 Introduction

As smartphone penetration is expected to reach 99% in North America and 92% in Western Europe by 2021 (Cisco Mobile VNI, 2017), it seems that the potential organizational effects of mobile apps have been largely neglected. Given that apps help users to share and collaborate, they have the potential to impact all organizational activities (Torres, Haesevoets, and Holvoet, 2013). Despite this potential, only few studies so far have investigated the organizational impacts of apps (Knoesen and Seymour, 2016; Sørensen and Landau, 2015). Against this backdrop, the present study aims at contributing to existing knowledge about the organizational implications of app deployment by empirically investigating the behavioral effects of deploying a fleet-management app. Specifically, this study focuses on the following research question: Can a fleet-management app positively influence the behavior of employee drivers?

Risky driving behavior refers to hard braking, acceleration, speeding, and turning (Castignani, Derrmann, Frank, and Engel, 2015; Musicant, Bar-Gera, and Schechtman, 2010). Two technologies that can record and enable access to data about risky driving behavior are In-Vehicle Data Recorders (IVDRs) and apps. Unlike IVDRs, which improve driving only through real-time notifications and periodic reports, apps also allow pre-driving app use for training and learning purposes. This study empirically explores how mobile apps influence driver behavior, by shifting the focus from notifications while driving to pre-driving app use, a capability that exists in apps but not in IVDRs.

To address this research question, a large-scale organization provided data collected from 109 employed drivers who performed 11,805 trips. The fleet-management app provides the studied organization with two main capabilities related to the risky behavior of its drivers: (1) real-time notifications to drivers while driving about their risky behaviors (e.g., accelerations in turns, braking while turning or sudden brakes, and speeding over limitations), and (2) the ability to explore driving behavior while the driver is not engaged in driving. Given these capabilities of the studied app, the data gathered facilitated the exploration of how risky behavior is affected by pre-driving app use and real-time notifications.
2 Research model

The research hypotheses formulated in this study describe how risky driving behavior is affected by the two explanatory variables of pre-driving app use and app notifications. “Risky driving refers to behaviors that do not intend to cause harm to others but potentially have negative outcomes because precautions are not taken. Such behaviors may be socially unacceptable or socially acceptable but dangerous” (Ge et al., 2015, p.76). Given the scarcity of studies about the effects of apps on driver behavior, hypothesis development mostly relies on the literature about the effects of in-vehicle devices (Musicant et al., 2010; Musicant, Bar-Gera, and Schechtman, 2014; Toledo and Shiftan, 2016).

The resulting research model is depicted in Figure 1.

![Figure 1. Research model](image)

Fleet-management apps, aiming at the reduction of risky behavior in subsequent trips, expose drivers to personal safety analysis of trips, including incident rate, driving routes, and simulations of how and when risky behavior occurred. App capabilities can therefore be a substitute for electronic reports and for personal feedback from a fleet manager. Thus, we propose the following hypothesis:

**H1:** Pre-driving app use of the app reduces risky driving behavior.

The second hypothesis refers to the moderating effect of app notifications on the relationship between pre-driving app use and risky behavior, described in H1. If the driver acquires the knowledge about her driving behavior in real-time, she has less knowledge to acquire by using the app before driving. In contrast, a driver without the ability to acquire knowledge in real-time through notifications has more knowledge to gain by using the app before driving. Thus, we propose the following hypothesis:

**H2:** The existence of notifications while driving weakens the negative effect of pre-driving app use on risky behavior.

3 Methods

For the purposes of this study, we sampled 16,443 trips by 109 drivers, who drove 28 cars. Outliers in terms of trip distance or duration were excluded from the sample, yielding a total of 11,805 trips. The two explanatory variables in this study were measured as follows. Pre-driving app use was measured...
as the number of times the driver used the app in the week preceding the specific trip. Notifications were measured as a binary variable, indicating whether the driver received notifications while driving (‘1’) or not (‘0’). Risky driving behavior was measured as a count of speeding, braking, turning, and accelerating incidents in a single trip, which is an accepted measure of risky driving behavior in the transportation and safety literature (Bell, Taylor, Chen, Kirk, and Leatherman, 2017; Ehsani, Simons-Morton, Xie, Klauer, and Albert, 2014; Musicant et al., 2010, 2014). Given the possibility of inter-correlations among explanatory variables and the need to include interaction terms in data analysis to test H2, the variable of pre-driving app use was mean-centered prior to data analysis as a way to decrease the threat of multicollinearity (Cohen, Cohen, West, and Aiken, 2013). Data analysis controlled for the effects of trip distance (the variable of trip duration was excluded because of a high correlation with distance), car ID, and driver ID. To test the three hypotheses, mixed-effects Poisson regression models were used with pre-driving app use, notifications, experience, and distance as fixed effects, car ID and driver ID as random effects, and risky behavior as the explained variable. We used Poisson regressions because the explained variable was measured as a count of driving incidents during a trip.

4 Results

Consistent with our reasoning, pre-driving app use was found to have a significant negative effect on risky behavior ($B=-0.528, p<0.001$). Notifications ($B=-0.261, p<0.01$) were also found to negatively affect risky behavior, implying that they were associated with smaller numbers of driving incidents. The coefficient for the interaction of pre-driving app use with notifications was positive and statistically significant ($B=0.514, p<0.001$), thus providing support for H2.

5 Conclusions

Our findings show that the more drivers use the app prior to driving, the less they are likely to be involved in driving incidents. It is important to note that this finding is correlational rather than causal. Although we used a time lag to ensure that use precedes driving, and although we included the driver as a random effect in the regression analysis, we are unable to completely rule out the potential confounding effects of situational variables given the data available to us. Nonetheless, this finding is indicative of the ability of app use to change driver behavior. Furthermore, the results show that the availability of notifications about driving behavior in real time mitigates the behavioral effect of app use before driving and that experience with the app increases this effect. To the best of our knowledge, such evidence about the behavioral consequences of app use in an organizational context have yet to be reported in the literature.

The implication of this study for practice is in understanding the importance of pre-driving app use in reducing risky behavior and in exploring how this relationship is moderated by notifications. The results of this study imply that senior managers and fleet managers are advised not only to acknowledge that risky behavior is an important matter that should be dealt with, but also to encourage drivers to learn from their incidents (Sulzer-Azaroff and Austin, 2000). Moreover, for further reductions in risky behavior, fleet managers should tighten driver supervision, encourage drivers to increase pre-driving app use, reward the best drivers, and set a minimum goal for pre-driving app use to overcome the moderating effect of notifications. The results demonstrate the significant value of app deployment in an organizational context.
References


List of Papers

1. Perception of Social Norms Violation in Shared Augmented Reality, Lev Poretski, Joel Lanir and Ofer Arazy

2. Crowdsourcing Privacy Design Evaluation, Oshrat Ayalon and Eran Toch

3. Politeness in HCI – A Conceptual Framework and Some Empirical Findings, Ella Bar-Or and Noam Tractinsky

4. Topic Authenticity Measurement, Aviad Elyashar, Jorge Bendahan and Rami Puzis
PERCEPTION OF SOCIAL NORMS VIOLATION IN SHARED AUGMENTED REALITY

Complete Research

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Keywords: Augmented reality, social norms, qualitative research

1 Introduction

Novel technologies enable new forms of human interaction, often challenging existing norms of behaviour. We investigate how social norms are affected by shared augmented reality technology (shared AR). AR allows the overlaying of a virtual layer of information or graphics on top of the physical world, enabling a level of contextualization as never seen before (Azuma 1997). The virtual layer may include textual information that describes and annotates the physical reality, or alternatively a virtual object embedded in the real world. Many AR applications involve some form of social interaction evolving into Shared AR, where social norms of behavior are a critical factor to consider.

Much can be learned from the history of the file sharing technologies: the unique characteristics of information-based goods (i.e. non-excludable and non-rivalrous) and the availability of a ubiquitous sharing platform, prompted consumers to violate prior established norms and to collectively infringe copyrights laws at large scale, which prompted extensive and heated public debates and changes in the legal, social, ethical and technological frameworks within which file sharing occurs.

To date, the research in the field of AR has focused mostly on the technical and cognitive issues around users’ experience and interaction, whereas the social implications of technology use are mostly neglected. However, the advancement in AR technology, coupled with the increased availability of AR applications, raises concerns over the ways in which AR technology should be designed and used. As of today, there are no commonly accepted norms, ethical guidelines, or rules to regulate the usage of AR technologies in socially appropriate and ethically accepted ways.

To this end, we conducted an exploratory study of user experience in a shared AR context, aiming to gain insights into participants’ feelings around the use of the technology. We simulated three possible social interactions between pairs of participants and used semi-structured interviews to capture participants’ ownership and identity-related perceptions. Our findings indicate that attaching and interacting with the virtual elements in the physical environment may produce tensions over potential violation of the norms related to identity, territoriality and psychological ownership.

2 Method

To explore the potential of SAR to violate an existing normative space, we conducted the preliminary exploratory study. 10 participants enacted the set of 3 social scenarios interacting in shared augmented reality space. In the first scenario, there were virtual masks attached to the face of the participants (BODY scenario). In the second scenario there were virtual dogs released around them while they
were asked to imagine that this is happening at their home (HOME scenario). In the third scenario, there were virtual figures attached to the participants' personal items, such as laptop, phone, or bag (ITEMS scenario). Via semi-structured interviews, we assessed the participants’ perceptions of possible conflicts and violations of social norms when interacting within shared AR setting.

3 Findings

Our participants often considered the idea of someone attaching virtual elements to their body, belonging or personal space inappropriate or even unacceptable. Concerns over one’s identity emerged as one of the strongest themes in our interviews. Identity is a social construct, that can be defined in the context of “what and where the person is in social terms” (Stone 1990). Thus the identity is both the inner experience of individuals of themselves, and their perception by others. Both aspects (which we categorized as personal identity and public identity) emerged from the interviews. Quotes below demonstrate these aspects:

“There is some level of violation, even if I do not know that something was placed on me. [Violation] of me, of what I am at this moment. Like, something very basic.” [P12, female, 23, law student]

“This is like shaming, but even more awful. [...] everyone can do what they please [in terms of attaching the virtual elements to one's body]” [P1, female, 28, office worker].

Participants’ quotes suggest that they integrated both their own body and their personal items into their sense of self on a deep and visceral level. Augmentation of these elements led to the overall perception of identity disruption. Additionally, the participants emphasized that the setting of shared AR makes managing one’s social identity an overly complex and emotionally draining task, which requires constant vigilance and increased self-awareness.

Our analysis has unveiled two other themes on which participants have shown concerns: feeling of violation of personal space and feeling of violation of psychological ownership over one’s self and personal belongings. Ownership and personal space are pivotal concepts that help us to make sense and navigate our social and private lives (Rudmin & Berry 1987; Richins 1994). They are interrelated in a sense that a person can experience a feeling of ownership towards her own personal environment, and desire for “space” is a precursor to the development of the feeling of ownership (Pierce et al. 2003). Both these concepts have cognitive and affective components and are different from the legal meaning of the word.

Many participants felt that the virtual augmentations violated their personal space. The following quote demonstrates this: “As I see it, it is ... an invasion of my personal space [...] even if it will be my brothers ... as soon as someone else with the AR device can see [the augmentation] ... this is an invasion of my space” [P10, female, 23, social worker]. The participants also exhibited concerns related to their sense of threat to the psychological ownership over their belongings when attaching virtual elements to them. Naturally, participants perceived their belongings as their own, with all associated rights. They clearly indicated that no one can attach virtual augmentations to their possessions, except from when the person attaching the augmentation has been given explicit consent prior to the action. One participant stated: “I will not allow ANYTHING. This is really critical for me. MY stuff. Nobody is allowed to [create the augmentations]” [P14, male, 31, programmer].

The concerns related to identity, personal space, and ownership affected how the participants perceived the interaction and led them to articulate the following requirements for designing shared AR experiences. The most prominent requirement that was raised by participants was the ability to control all actions related to virtual elements placed in their physical environment. Namely, participants sought control over who can: (a) create (b) change (or delete) and (c) view the virtual augmentation. Second requirement was existence of the regulation that would ensure shared AR settings are safe and socially acceptable. According to participants, a mutual understanding of what is allowed in the augmented reality “playground” could be established only on the basis of a normative
and regulative framework, which would govern social interactions in shared AR places. The summary of our findings is presented in Figure 1.

![Diagram of social norm categories]

**Figure 1.** Perceived Threats to Social Norms in shared AR and Design Recommendations by the Participants.

## 4 Conclusion

In the early days of the internet, the availability of log data prompted companies to collect unlimited data about individual’s online behaviour. In the years that followed, the potential risks to users’ privacy were recognized, leading to the development of privacy norms and a global legal action to protect people’s online privacy. Furthermore, privacy considerations are now part of systems’ design (i.e., “privacy-by-design”). We draw parallels to augmented reality, arguing that the advent of AR as a novel form of human-computer interaction calls for the development of social norms that would regulate behaviour in these realms. We maintain that it is essential to enhance AR technology with design features and social norms that would standardize issues of ownership, identity, and personal space. We envision these social concepts to become a pivotal concern in the shared AR environments and foresee the emergence of ownership-by-design and identity-by-design guidelines for the design of AR systems.

## References


CROWDSOURCING PRIVACY DESIGN EVALUATION

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Keywords: privacy, privacy by design, crowdsourcing, information systems development

1 Introduction

When designed incorrectly, information systems can thwart people’s expectations of privacy. An emerging technique for evaluating systems during the development stage is the crowdsourcing design critique, in which design evaluations are sourced using crowdsourcing platforms. However, we know that information framing has a serious effect on decision-making and can steer design critiques in one way or another. We investigate how the framing of design cases can influence the outcomes of privacy design critiques. Specifically, we test whether ‘Personas’, a central User-Centered Design tool for describing users, can inspire empathy in users while criticizing privacy designs. In an experiment on Amazon Mechanical Turk workers (n=456), we show that describing design cases by using personas causes intrusive designs to be criticized more harshly. We discuss how our results can be used to enhance privacy-by-design processes and encourage user-centered privacy engineering.

2 Objectives and research questions

In this study we aim to understand whether and how the framing of design questions with personas affects privacy design decisions. Although personas are usually used within a designer's community and not with respect to the general population, our intention remains the same. We want the audience, here non-experts, to develop a better understanding of end-users through the presented privacy problem. We expect that different levels of persona presentation will result in varying levels of empathy toward end-users, eventually affecting the decisions made. In the following section, we further describe how we have defined different levels of personas. Additionally, as we refer to privacy design decision-making by people, we consider a personal aspect: individuals’ perceived levels of privacy. We expect decisions related to privacy to be associated with personal perceptions of having privacy. We assume the applications that we test to be general in the sense that any smartphone user can operate them to regard a general crowd as a candidate for the analysis. Our expectations lead us to make the following hypotheses:

H1. Design decisions made about privacy are less privacy-intrusive when the level of persona presentation is higher.

H2. Design decisions made about privacy are more privacy-intrusive when the perceived privacy, i.e., the extent to which one feels he or she has privacy, is higher.

3 Research method

To examine our hypotheses, we designed a between-subject user study (n = 456), using an online experiment that included a questionnaire. We recruited the participants via Amazon Mechanical Turk. We used a seven-point Likert scale, where 1 represented low agreement and 7 represented high...
agreement. The study was authorized by the institutional ethics review board (IRB) and occurred in January 2017.

The primary goal of the experiment was to compare effects of the framing of design decisions on the intrusiveness of the chosen design. Accordingly, the participants were randomly assigned to one of three conditions groups. We developed three questionnaires that only differed in the levels of persona presentation. We refer to the different conditions as “data,” “basic persona,” and “advanced persona.” The questionnaire opened with a description of a general scenario. The participants were asked to make design decisions as team members of a software company that develops applications. For both advanced and basic persona conditions, additional information referring to interviews held with end-users was shown. It was noted that the interviews had been designed to help the team develop a stronger understanding of end-users’ behaviors and views on the new applications.

Next, five different mobile applications were randomly described to examine the study’s dependent variable: privacy intrusiveness. The applications’ names were invented, but we based the applications’ functionalities on existing applications. For example, one application was named as “WeMail” and it enables users to manage their emails. For all of the conditions, the participants were presented with the application name, one screenshot, a short explanation of the application, and a sentence describing a particular case related to the application.

In designing the persona conditions, we were inspired by the definition of personas given in the literature (Pruitt and Adlin 2010). For the basic and advanced persona conditions, the design was represented using a user’s quote given under an invented end-user name. For the advanced persona condition, additional information on the end-user was presented, including a picture and a short description. It could be easily understood that the quotes and details referred to end-users who had been interviewed and who had been mentioned at the beginning.

The rest of the questionnaire elicited information on other independent variables. We referred to the participant’s perceived levels of privacy. The participants were asked to contemplate the degrees of access that websites and apps have to their personal information and to answer several questions drawn from Dinev et al. (Dinev et al. 2012). Another personal aspect that we measured was that of empathy based on two of Davis’ (Davis 1980) four recommended empathy measurements: empathic concern and perspective taking. Finally, the questionnaire closed with demographic questions.

4 Results

We begin our analysis by reviewing the distributions of responses given on the questionnaire’s main constructs. Figure 1 shows differences in the mean privacy intrusiveness scores among the presentation conditions. When persona presentations were used, privacy design decisions made were found to be less privacy intrusive. An ANOVA analysis shows a significant difference between the three conditions (F(2,453) = 5.34, p = 0.005). A post hoc t-test analysis shows a significant difference between the persona and data conditions (p-value: advanced vs. data: 0.018, basic vs. data: 0.002). The difference between the persona conditions was found to be insignificant. The data presentation mean privacy intrusiveness score was the highest (mean = 3.46, SE = 0.11), and the advanced and basic persona presentations received lower scores (advanced personas: mean = 3.06, SE = 0.12; basic personas: mean = 2.94, SE = 0.12).

Next, we examined our hypotheses by conducting a regression analysis for predicting privacy intrusiveness. The regression consisted of six variables and latent variables (Table 1). The regression model (adjusted R² = 0.312) pointed to two significant predictors affecting intrusive privacy decision-making: the level of persona presentations and the participants’ perceived levels of privacy. We found that the existence of personas affected privacy intrusiveness in both basic and advanced persona conditions: (a) basic personas compared to data (β = -0.519, p < 0.001) and (b) advanced personas compared to data (β = -0.307, p = 0.03). The results show that the persona presentations spurred less privacy-intrusive decision-making, confirming our first hypothesis. Our second hypothesis was also
confirmed. We found that perceived privacy affects privacy intrusiveness in an opposite direction compared to personas presentations and that it has a positive effect. The more the participant had a stronger perception of having privacy the decision made was more privacy-intrusive.

Other latent variables were found to be non-significant and were used as our control. We found that both constructs representing personal empathic elements, empathic concern and perspective taking did not have a significant effect on privacy intrusiveness. Effects thus resulted from increasing empathy through persona presentation and not as a result of being more empathic in general. Finally, both age and gender were found to be non-significant variables.

## 5 Conclusions

This paper investigates privacy design evaluation under the normative assumption of promoting privacy-respectful system design. Our study explores how personas, which are typically used to help designers analyze and capture end-users’ experiences, can actually deliver a more emphatic design critique. Using an online experimental design, we found that framing privacy design dilemmas based on end-users’ perspectives and not solely as a matter of “data” limits the extent to which decisions made are privacy intrusive. We compared the experiment’s conditions based on ascending levels of persona presentation and found that the existence of personas resulted in lower levels of privacy intrusiveness. We think that a possible explanation for our result is the evocation of empathy toward the end-users as a consequence of the persona presentations.

The findings reported in this paper have several implications for questions related privacy-by-design and user-centered design. First, we confirm our hypothesis on the use of personas and on their effects on privacy intrusiveness, opening up a design space for tools that use personas to enhance privacy in the development process. Second, the findings extend the conceptualization of usability and highlight new ways to explore similar relationships between personas and other ethical issues.

## References


POLITENESS IN HCI – A CONCEPTUAL FRAMEWORK AND SOME EMPIRICAL FINDINGS

Complete Research

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Keywords: Politeness, polite computing, social computing, human-computer interaction (HCI).

1 Introduction

Politeness is considered a manifestation of human civilization, and one of the most effective strategies modulating interpersonal relationship in human communication. It reduces conflict and supports cooperative interaction and thus regulates communication and enhances the quality of interactions. Although HCI research has recognized the potential importance of politeness to the design and use of interactive technology (e.g., Nass, 2004, Whitworth and Liu, 2010, Hayes and Miller, 2010), our review of the literature suggests that this is an underdeveloped area in terms of both theory and evidence. Previous research can be characterized according to two main streams. The first stream has focused on empirical demonstration of politeness’ role in human-computer interaction but without delving much into the nature of politeness (e.g., Nass et al., 1999). The other stream has focused on conceptualizing aspects of politeness in HCI, but provided no empirical evidence for their effects (e.g., Hayes et al., 2002, Whitworth and Liu, 2010).

2 Objectives

Our objective is to propose a more systematic treatment of politeness in HCI by bringing to bear existing social science frameworks that suggest rules for efficient and resilient communication between people. We see this as a starting point for a research program with three main goals. First, we would like to explore the conceptualization of polite computing based on its treatment in the fields of pragmatics and sociolinguistics. We are also interested in contextualizing politeness in different HCI domains to which the concept may apply, e.g., traditional HCI, computer mediated communication (CMC) and human-robot interaction (HRI). Finally, there is a need for developing measures to gauge users’ perceptions of the politeness of interactive technology and to support experimental manipulations of the politeness construct. In this paper, we focus on the first objective, and on providing illustrations from different contexts.

3 Politeness Theories and usage in HCI

Theories of politeness have been proposed mainly during the 1970’s and 1980’s within the academic fields of sociolinguistics and pragmatics. Notable theories include Lakoff’s (1973), Leech’s (1983) and Brown and Levinson’s (1987). All these theories correspond with Grice’s (1967/1975) seminal work. Grice has formulated the Cooperative Principle (CP), the gist of which was that you should “make your conversational contribution such as is required, at the stage at which it occurs, by the accepted purpose or direction of talk exchange in which you are engaged" (p.45). The principle focuses on rational and efficient human communication. It relies on four conversational rules regarding the quantity of the information provided; the quality of the information; its relevance; and the manner by which it is delivered. Grice views conversations as an instant of purposive behavior and have argued that the principle and the maxims are likely to have their analogies beyond talk.
exchanges. This is highly important for the context of HCI, in which politeness may be associated not only with verbal or textual messages, but also with other aspects of system behavior.

HCI research on politeness seldom relies on politeness theory. When it does (Johnson and Wang, 2010; Wu et al., 2010), it relies on Brown and Levinson’s (1987) theory, which centers on the concept of “face.” We chose, instead, to base our framework on Lakoff’s (1973) work. We believe that the principles suggested in that work lend themselves more easily to the sphere of non-talk behavior, an important criterion for politeness in HCI. Lakoff suggests that pragmatic conversation or behavior contains two rules, whose importance depends on the situation. These are Grice’s CP, which Lakoff refers to as the rule of clarity, and the rule of politeness. The rule of politeness includes three sub-rules: don’t impose, give options, and be friendly. Lakoff shares Grice’s general view of politeness as not only based on verbal exchanges but as one that also includes non-verbal acts. Such acts can often be found in human-computer interaction. For example, users may consider impolite an operating system that forces shutdown after software updates, social networks that push notification on every user activity, or a popup window that covers a website’s content.

4 Current Research

Our view of the role of politeness in HCI is summarized in Figure 1. Interactive products, systems, robots, or people with whom we communicate via computers may behave in ways that can be described along the two dimensions of what Lakoff (1973) termed pragmatic behavior. These dimensions include the rules of politeness and clarity and their associated sub-rules. We expect such behaviors, to be perceived by users of those products and systems. Next, these perceptions are translated to higher-order evaluation of the interaction in terms of politeness and clarity, e.g.: Does the robot exhibit polite behavior? Does the application communicate clearly its state and its messages to the user? Finally, we suggest that our sense of politeness and clarity may influence additional perceptions of the interaction, such as enjoyment, trust and satisfaction. To test the viability of this framework we conducted two studies, which are briefly summarized below.

Figure 1. A stage model of politeness in human-computer interaction.

4.1 Study 1

In this study we have developed questionnaire-based measurement scales of perceived politeness and clarity. We conducted three rounds of item generation and reduction using exploratory factor analysis. We then tested the scales using confirmatory factor analysis in the context of users’ evaluation of a CMC application (facebook). In addition to clarity and politeness, the questionnaire included scales of satisfaction and ease of use for the purpose of testing discriminant and concurrent validity. The results of the CFA revealed that the model fits the data adequately ($\chi^2(113)=249.032; \chi^2/df = 2.20; TLI = .95$;
NFI = .92; CFI = .96; SRMR = .049; RMSEA = .069 (90% CI = .057–.081). The scales were reliable, with both AVE and CR well above the recommended thresholds of 0.5 and 0.7, respectively, and the correlations between the scales were in the expected direction.

4.2 Study 2

In the context of computer-based dyadic cooperative game, we manipulated three clarity rules (“quantity,” “relevance” and “manner”) and two politeness rules (“give options” and “be friendly”), to test whether they affect users’ perceptions. The manipulation of the clarity rules did not succeed. However, the manipulation of the politeness rules was effective. The analyses indicated that designing the system to follow politeness rules affected the participants’ perception of their partner’s politeness and of the gaming software. In addition, participants in the Polite-High condition enjoyed the gaming session more than participants in the Polite-Low condition. The findings demonstrate that a systematic study of politeness can contribute to our understanding of this HCI area and to improving the design and evaluation of interactive systems’ politeness.

5 Summary

The results of the two studies support the basic propositions of the framework and may serve as a first step towards a more systematic research on politeness in areas such as HCI, CMC and HRI. In addition, future research should also consider the influence of culture and other contextual factors on the relations among the framework’s constructs.

References

FAKE NEWS MEASUREMENT USING TOPIC AUTHENTICITY

Complete Research

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Keywords. fake news, topic detection, link prediction, machine learning.

1 Introduction

Today, online news rapidly replace traditional media outlets. The main two reasons for the prosperity of online news are the ease of access using ubiquitous smart devices and content generators, which provide users with a steady stream of personalized news, derived from a wide variety of sources (Lavie et al. 2010).

Although online news infrastructure provides numerous benefits like personalized feeds, instant updates, automatic categorization of feeds, etc., it comes with a few shortcomings. The nature of online news publication has changed, to the point that the traditional fact checking performed by a core editorial team in order to prevent potential deception is frequently absent or incomplete, due to the stream of material from content generators. In the rat race to obtain greater number of hits to garner more advertisement clicks, content generators knowingly or unknowingly publish content whose facts are not verified (Conroy et al., 2015). Moreover, great number of claims are actively promoted by interested parties through plethora of abusers, such as crowdurfers, socialbots, fake accounts and similar bad actors (Elyashar et al., 2017).

In this paper, we present a method for estimating the authenticity of topics discussed in online social media (OSM). The proposed method employs machine learning (ML) approach for classifying OSM accounts participating in the online discussion as either OSM abusers or legitimate accounts. Link prediction-based features are found useful for assessing the similarity of classified accounts to the labelled accounts. For evaluation, we used four different datasets collected from Twitter. Our results show that the suggested approach is effective for discriminating between topics that were strongly advocated by fake news promoters and those that attracted authentic public interest.

2 Research Method

We propose novel approach for assessing the account authenticity which is later used to discriminate between online discussions artificially promoted by fake news promoters discussion that attract the interest of authentic OSM accounts.

2.1 Data Collection and Topic Detection

We used four different Twitter datasets during research. Two of them were crawled by VICO Research & Consulting GmbH, the third was provided by (Morstatter et al., 2016). The fourth dataset was the Kaggle Propaganda, which includes solely fake news promoters: 17,410 tweets published by 112 pro-ISIS fanboys from 2015 Paris terrorist attacks until 2016. In order to gain also legitimate
accounts for author classification, we used latent Dirichlet allocation (LDA) (Blei et al., 2003) topic detection algorithm with hyper-parameters optimized for the targeted OSM in order to identify online discussions. Each online discussion or topic is composed of several terms. We chose the top ten terms in each topic by probability and retrieved 100 recent tweets that included these terms using the Twitter REST API. Eventually, we collected 27,654 tweets that were published by 360 accounts.

2.2 Account Labelling

For the evaluation phase, we collected a ground truth. We propose two alternative approaches for creating labelled datasets of OSM accounts. The first labelling approach is based on manual inspection of the OSM accounts (McAuley et al., 2012). The second approach is based on acquiring a collection of OSM accounts that are known with absolute certainty to participate in crowdturfing platforms.

Figure 1.  Methodology

2.3 Account Authenticity

For estimating the authenticity of accounts, we presented the method which is based on a ML classifier. ML classifier is the by-product of the activity of supervised learning, in which the classifier (also known as learner) studies the differences between records based on a set of manually classified records. We proposed five different similarity functions: common-posts shows which accounts spread the same content across the online social network, bag-of-words which measures the similarity between the vocabularies used by two accounts, topic-distribution which measures the similarity between two topic vectors that represent the relevance of the author to each topic, profile-properties compared based on the features extracted from their profiles, and behaviour-properties which compares the account behaviour feature vectors where each account is represented by vectors of features describing the account behavioural characteristics. We evaluated the similarity functions by applying a KNN classifier (with 0 < k < 6). The size of the training set varied from 1% to 40% of the labelled accounts in each dataset (see Figure 2). We found that the similarity function with the best performance across all datasets was bag-of-words.

Figure 2.  Similarity function performance on Verified Abuser dataset
In addition to the standard features used for OSM account classification, we propose a set of new features based on link prediction. Link prediction techniques are applied on the common-posts and co-citation graphs to assess the similarity an OSM account to a set of randomly selected known fake news promoters. For example, feature named ‘Link prediction - max - total friends - common posts - fake news promoter’ depicts the maximal number of neighbours a given account has in the common-posts graph with the set of selected fake news promoters. Link prediction-based features are generated for every combination of (1) the two graphs: common-posts and co-citation, (2) the link prediction measures: Jaccard’s coefficient, common neighbors, preferential attachment (Barabási and Albert, 1999), Adamic-Adar index (Adar and Adamic, 2005), total friends, transitive friends, opposite direction friends (Kagan et al., 2016), and Bayesian promising (Stern et al., 2013), and (3) the aggregation functions: minimum, maximum, mean, median, skewness, and kurtosis. According to the information gain, among the top ten most significant features, six features were link prediction-based. In regards to performance, we note that the best classifier was trained using XGBoost on all the features with an AUC of 0.935, accuracy of 0.89, and precision and recall of 0.913, and 0.923 respectively.

**Topic Authenticity**

We estimate the topic authenticity using the confidence level provided by the best trained classifiers for each method. We define authenticity of the account $x$ as the confidence of $x$ being a legitimate account. The last step of the proposed approach is aggregating the authenticity of individual OSM accounts into authenticity of topics (the inner ring in Figure 3). In addition, every author is weighted according to his participation in the topic (the outer ring in Figure 3). Participation of an author in a topic is derived from the topic probabilities of his or her posts. An account is associated with a topic if it contains at least a single post associated with that topic. In order to visually represent the authenticity of each topic, we used donut charts as depicted in Figure 3.

![Figure 3. Authenticity distribution in two topics from Kaggle Propaganda](image)

We show the authenticity distribution of two topics identified in Kaggle Propaganda dataset. In the middle of each donut chart, we include the word cloud representing the topic. Each word cloud includes the terms with the highest probabilities. The inner cycle of the donut chart enclosing each word cloud represents the account authenticity distribution. Similarly, the outer cycle depicts the post level authenticity distribution. Green and red colour represent authenticity scores that equal to 1 and 0 respectively. High and low authenticity scores resemble a legitimate account and fake news promoter respectively.

**Conclusions**

Using the proposed method, we demonstrated the distribution of accounts’ authenticity for each topic. As a result, we identified topics that are prone to OSM manipulation, as well as topics that attract authentic public interest. In addition, we introduced an approach for collecting data when there is only
information from one class. We believe that this method can be valuable to others when there is a need of collecting samples from the other class in the same context. Finally, the discovery that \textit{link prediction} features are capable of improving author type classification is very important and may be an indication of the key role these features play in the domain of fake news identification. In the future, we plan to evaluate the presented approach on additional datasets spanning fake news in multiple domains, such as politics, product reviews, etc. We think that it would be interesting to estimate whether the \textit{link prediction} features are useful only in the domain of ISIS fake news or they are also useful for classification in other different domains.

\section*{References}


Session 2a: 12:05 – 13:25

Chair: Noa Regonis

List of Papers

1. PO Approach in System Analysis & Design Course, Ronit Shmallo and Tammar Shrot

2. Students Perception of Online Spaced Repetition in a Database Course, Gali Naveh and Boaz Gordon


4. Automatic Conversion of User Stories to Test Cases, Sali Weitzman and Hadas Chassidim

5. Sustain-All Language Learning, Rina Zviel-Girshin, Christos Rodosthenous and Nathan Rosenberg
PROJECT-ORIENTED (PO) APPROACH IN SYSTEM ANALYSIS & DESIGN COURSE

Research in Process

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Keywords: engineering education, learning environment, project oriented (PO), qualitative research

1 Introduction

College students complain that their studies are mostly theoretical and do not prepare them for the "real" world that awaits them at the end of their studies. According to Monterio et al. (2017), students are deprived of the opportunity to develop their abilities over the course of their academic programs, mainly due to not applying the retained theories in a way that associates technical content with their professional fields. To make the learning environment in the engineering professions a more creative, challenging, and practical experience, Shamoon College of Engineering (SCE) implements the Project Oriented (PO) approach. In this paper, we introduce how we change a traditional academic course, in which the teacher is at the forefront of the classroom and serves as a source of knowledge for the student, to a PO course. The course deals with the analysis and design of information systems in an object-oriented approach, taught in Software Engineering and in Industrial Engineering and Management.

2 Objectives

The study's objectives are: (1) Comparing the traditional to the PO approach. Discussing the benefits and drawbacks of each approach and the teaching implications. (2) Checking if the PO approach increases the student motivation vs. the traditional approach. (3) Understanding the expected changes in the course structure: the activities, the roles of the students and TA staff. (4) Developing materials and activities in order to enhance students' involvement and activity in the learning process.

3 The approach – Project Oriented

The PO environment is an active learning approach, like Problem Based Learning, Project Based Learning, and Discovery Learning (Prince & Felder, 2006). Teaching/learning via projects is not a new idea in academia. The innovation is that lecturers combine the execution of projects in courses previously taught in traditional approaches (Frank et al., 2005). This fosters the creativity and application of the material learned through competitions and various projects. The projects are the result of the creativity of the lecturers and collaborations with industrialists and companies in the economy. The approach enables students to transform their accumulated knowledge into an engineering solution. Many of the projects are intended for the needs of the community. We will note carefully, that no studies have investigated the contribution of the PO approach to learning, except Chassidim et al. (2017), who found that using PO in the software-engineering obligatory course promoted the special needs of software engineer, especially the soft-skills, effectiveness of the teamwork, and the overall development process of the project.
3.1 The Course structure in PO approach

The unique format of the course is based on the assumption that self-practice will enrich the students' knowledge and motivation. Traditional class is replaced by a modern approach of self-learning in the methods and times the students prefer. Yet, the lecturer and TA are still accessible to the students in pre-defined times for questions as well as consulting and brainstorming how to implement the materials in their personal project, which simulates a "real world" problem.

The course topics were divided into: (1) Simple subjects that the students acquire and practice by themselves. The course staff is available for questions if needed. (2) Subjects that include important highlights. In this stage, the students are required to come to a meeting with the course staff, to make sure they understand the important references. (3) Complex subjects in which the students might experience difficulties while studying. These subjects are taught in the traditional way.

At the beginning of the semester, the students are partitioned into groups, and each group needs to select a subject for their project. During the semester, they are required to submit a number of assignments and analysis documents of their project. At the end, they need to present the whole project. Their course final grade is based on their performances in all those assignments.

3.2 The special activities

Two special methods are used: Learning from mistakes and Gamification. Students learn from each other’s mistakes by having to analyze the work of another. In addition, they are given the possibility to resubmit their previous work with an explanation of why they changed their work. Thus, allowing them to learn from the mistakes they made previously and improve their understanding. Gamification is used to enhance students' motivation. Instead of a normal course representation, the lecturer and TA are represented as the head of R&D team in a company that hires the students for a "3-month trial period", where they are expected to form teams and develop their own system. Future meetings are presented as consulting or work meetings meant to promote the project. These methods were chosen because they correspond to the PO approach. They challenge the students by their differences and their uniqueness and enable students' interest and motivation to increase.

4. Research Method

The study will use qualitative research that will be expanded and complemented through quantitative analysis. All the activities will involve two populations in the SCE College of Engineering – a group of 36 students in the Industrial Engineering Department in their third year, and a group of 46 students in the Software Engineering Department in their second year. The research tools are: intermediate exercises, final project, and an attitudes questionnaire about the PO approach, in which the students relate the way they have experienced the new teaching method. After completing the questionnaire, about 10% of the students from both groups will be interviewed about their answers.

References


STUDENTS PERCEPTION OF ONLINE SPACED REPETITION IN A DATABASE COURSE

Research in Progress

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Keywords: Spaced Repetition, Information System Education, e-Learning, Students' Perspective.

1 Introduction

Spaced repetition is a teaching/learning methodology in which learning material is reviewed in increasing time intervals. The methodology was introduced in 1932 by Mace (Mace, 1932). Mace suggested spaced repetition improves learning process, emphasizing the role of active recall of material. Spaced repetition has been proven to be effective for decades in hundreds of experiments (Kornell et al., 2010), most of them focused on memorization. However, more recent research findings suggest spaced repetition may also be effective in inductive learning (e.g. Kornell et al., 2010; Kornell and Bjork, 2008). Although many examples of spaced repetition incorporation into academic teaching exist (e. g. Cavus and Ibrahim, 2009; Taveira-Gomes et al., 2015), the authors could not find a case describing such use in an Information Systems (IS) education.

In this study, on-line spaced repetition was used in a database course in an Engineering College, and students' perception of this learning practice was examined, as detailed next.

2 Methodology

The database course is an integral part of the Information System track in Shamoon College of Engineering. The mandatory course (for IS track students) is three hours of lecture and two hours of exercise, offered in the first semester of the third year of an Industrial Engineering and Management (B.Sc.) degree.

In the fall semester of the 2018 academic year, the teaching staff included in the course requirements a weekly on-line assignment composed of 4-8 multiple answer questions. The average grade of the twelve weekly assignments comprised 10% of the course’s final grade. For that purpose, a pool of 198 questions, in varying thinking levels, from remembering to analysing (Bloom et al., 1956) was prepared and uploaded to the institute's Learning Management System (Moodle). Each weekly assignment included questions on the topic taught at the current week and questions on material taught in previous weeks, with growing intervals between each topic's questions. Figure 1 presents the number of questions on each topic the students were required to answer each week, with the different colours indicating the time passed (in days) since the introduction of the topic in class. The students were offered to perform each assignment up to three times, as the highest grade of the three attempts was calculated into their course final grade. Each attempt presented to the student randomly selected
questions from the relevant topics' pool of questions, and was limited in time (approximately 30 minutes). This methodology generated an active spaced repetition of the learning material.

In order to capture students' perception of the learning process and its effect on their perceived learning, a paper and pencil survey was administered after the end of the semester (and the final exams). The questionnaire was comprised of ten statements on which students were asked to indicate their opinion on a 7 point Likert scale.

![Figure 1. Spaced repetition performed in the course by topic and week](image)

### 3 Results

Out of 19 students enrolled to the course, 17 completed and returned the questionnaire (89.5%). Table 1 presents the mean and standard deviation of responses obtained.

<table>
<thead>
<tr>
<th>Item</th>
<th>Average</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. The weekly exercises were useful</td>
<td>5.88</td>
<td>0.99</td>
</tr>
<tr>
<td>2. The weekly exercises improved my understanding of the material</td>
<td>4.82</td>
<td>1.42</td>
</tr>
<tr>
<td>3. The weekly exercises improved my performances</td>
<td>4.76</td>
<td>1.30</td>
</tr>
<tr>
<td>4. I would like other courses to have weekly exercises as well</td>
<td>4.53</td>
<td>1.74</td>
</tr>
<tr>
<td>Exercises evaluation (average statements 1 - 4)</td>
<td>5.00</td>
<td></td>
</tr>
<tr>
<td>5. Incorporating previous material in the weekly exercises was useful</td>
<td>5.29</td>
<td>1.65</td>
</tr>
<tr>
<td>6. Incorporating previous material in the weekly exercises improved my understanding of the material</td>
<td>4.88</td>
<td>1.32</td>
</tr>
<tr>
<td>7. Incorporating previous material in the weekly exercises improved my performances</td>
<td>4.47</td>
<td>1.37</td>
</tr>
<tr>
<td>8. I would like other courses to incorporating previous material in exercises</td>
<td>5.12</td>
<td>1.80</td>
</tr>
<tr>
<td>Spaced repetition evaluation (average statements 5 - 8)</td>
<td>4.94</td>
<td></td>
</tr>
<tr>
<td>9. In general, weekly exercises is a good idea</td>
<td>5.76</td>
<td>1.39</td>
</tr>
<tr>
<td>10. In general, I am satisfied with the weekly exercises</td>
<td>5.41</td>
<td>1.37</td>
</tr>
<tr>
<td>General satisfaction (average statements 9 - 10)</td>
<td>5.59</td>
<td></td>
</tr>
</tbody>
</table>

*Table 1. Student's perception of the spaced repetition exercises (n=17)*

Average evaluation of students of the weekly exercise and the spaced repetition (see Table 1) were very similar (5.0 and 4.9 respectively), but higher (5.6) for the general satisfaction statements. Standard deviation of responses ranged between 0.99 and 1.8, with the highest standard deviations in questions focused on the incorporation of the methodology in other courses. Textual remarks by respondents addressing the usefulness of the methodology (rather than grading issues and workload) indicated that students found it helpful, but not relevant to all courses.
4 Discussion and Future Work

Students’ overall evaluation of the usefulness of spaced repetition practiced in the course was high (average above 5.5 for questions related to this issue), suggesting the methodology should be further explored in the context of IS education. However, in questions regarding the effect of the methodology on students’ learning, the average dropped below 4.9. This gap raises interesting questions regarding the usefulness of the learning methodology, as perceived by the students. It should be noted that the statistical analysis was performed on a small number of responses, due to the small number of students enrolled to the course. Indeed, these preliminary results yield more questions than answers, to be explored in further research. Future research may explore, among others, the effect of spaced learning in IS education on students’ performance, its perceived and actual contribution to learning in different IS courses and in various implementation methods, such as generating a personalized adaptive mechanism to match the questions presented to the students based on their pervious performance.

References


DETECTING AND CLASIFYING ERRORS, PERFORMED BY NOVICES, DURING BUSINESS PROCESS MODELING

Research in Progress

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Keywords: business process modeling, activity diagram, modeling errors

1 Introduction

Process-oriented information systems (POIS) are designed and implemented primarily to support the organization’s business processes. POIS logic is usually derived from the defined workflow of the process. Therefore, the business process logic must be presented explicitly, often via a process model. The process model is the basis for designing and implementing the business process in the system, as it clarifies the stretch between current practices and managements' desired ones. Incorrect modeling of the business processes can jeopardize the quality of services/products', as well as expose the organization to a variety of risks. Modeling requires substantial cognitive efforts, especially from novices. We therefore focus on the errors made by novices in the modeling task of a business process, intended to be deployed in an emergency room environment in a hospital. We picked this type of environment because it is highly dynamic, complex and involve multiple actors. To detect such errors, we asked students in the department of Industrial and Management Engineering to employ the UML’s Activity Diagram (AD) for preforming process modeling tasks. We chose this modeling language since it contains all the basic constructs required to complete a process modeling task. It is a relatively friendly modeling language to teach and learn (Russell et al. 2006). Another advantage of AD is that it is part of the UML family, which our students were familiar with. The students' models were analysed, and errors were classified and categorized. Despite an interest in the complexity of the process of modeling, particularly among novices (Katz, 2018; Katz & Shmallo, 2015; Kung, 2013; Watson, 2016), current studies have focused mainly on data modeling, rather than on the business processes modeling.

2 Research goals

1. To detect common errors, made by novices, during a business process modeling task;
2. To classify novices' errors with respect to 3 evaluative categories: completeness, correctness and redundancy avoidance;
3. To identify specific error-combinations;
4. To explain students' type of errors based on their past scholarly achievements, and perception of self-efficacy.
3 Research Method

We offered 180 students who recently took the course "IS analysis & design" as part of their IS studies to participate in the study. They were asked to perform the following tasks: (a) to model a simple process (preparing an omelette), without using a modeling language. This was done in order to collect baseline data regarding the students’ processual thinking. This task was taken before the students were taught business process concepts and modeling and particularly, AD, which was used as their modeling language for representing business processes; (b) At mid-course, the students were asked to model two processes relevant to two test-cases; (c) At the end of the course, the students were given an additional test-case to model. After each of the modeling tasks, we asked the students to assess the tasks’ level of difficulty, and their level of confidence at successfully completing the task.

Each student performed total of four modeling tasks, before, in the middle, and at the end of learning how to model business process. Thus, we analysed about 700 modeling tasks.

4 Initial findings

All the tasks were analysed in comparison to a prepared solution that was made ahead by two of the authors, who were also the lecturers in the given course.

The modeling tasks were checked, and each detected error was marked on the student's form, and added to the list of errors, which we kept in an Excel file. The tasks were checked by two of the authors. Then, each error was classified to one of the main categories: (1) correctness: to what extent is the model accurately conveys the processes exemplified in the test-case provided to them; (2) completeness: to what extent are all the necessary constructs (e.g., roles, processes, flows, etc.) presented in the model; and (3) redundancy avoidance: to what extent does the model contain redundant constructs.

In particular, we required that the student’s model includes the following:

- Detection of all the roles of the users participating in the process
- Detection of the initial and final nodes of the process
- Detection of all required flows in the process
- Detection of all required actions in the process
- Detection of pre-condition and post-condition where it is required in the process
- Detection of all decision / merge nodes in the process
- Detection of fork and join nodes (for parallel execution) in the process

Table 1 presents some of the common mistakes we identified, their corresponding categories, along with a short explanation for each error. The rest of the findings will be presented during the conference.

5 Conclusion and future work

The four sets of data allowed us to identify combinations of errors, study the students' learning curve, and hypothesize the relationship between their performance, and level of self-efficacy. The errors were studied using three quality criteria: completeness, correctness and irredudancy.
Studying students' errors allows us to map novices' weaknesses, so to improve our methods of teaching. It also allows us to classify which types of modeling tasks are especially demanding for novices. In a follow-up study, we expect to be able to suggest an intervention in accordance with this study's findings.

Table 1: examples of common errors along with their categories

<table>
<thead>
<tr>
<th>Category</th>
<th>Error</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>completeness</td>
<td>with respect to roles in the process</td>
<td>all required roles should appear in the model</td>
</tr>
<tr>
<td>completeness</td>
<td>missing flows</td>
<td>identify the lacking flows in the model</td>
</tr>
<tr>
<td>correctness</td>
<td>the lack of generalization with respect to the name of the roles</td>
<td>e.g., rather than indicating &quot;patient&quot; as a role, the real name of the patient was marked as a role in the model</td>
</tr>
<tr>
<td>correctness</td>
<td>the lack of generalization by reducing few required actions into one action</td>
<td>indication of one action instead of a number of required actions</td>
</tr>
<tr>
<td>irredundancy</td>
<td>with respect to roles in the process</td>
<td>indicates a redundant role (one or more) in the model</td>
</tr>
<tr>
<td>irredundancy</td>
<td>with respect to the fork and join node in the process</td>
<td>indicates one or more unnecessary join/fork nodes in the model</td>
</tr>
</tbody>
</table>

References


CONVERTING USER STORIES TO TEST CASES AUTOMATICALLY

Research in progress

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Key words: Software testing, automation, NLP, user stories, Agile, test cases

1. INTRODUCTION

Development of a software or a system is a complex process that is prone to errors. Software defects occur during each stage of the development process, and should be identified, fixed, and retested; the repaired software should be delivered as soon as possible in order to prevent their spread in the system. The importance of software testing has grown with the adoption of Agile development and continuous methodologies. These advanced methodologies should support quick changes, as the testing is one of the main activities in the development life cycle, and consumes a lot of resources. Software testing is one of the main indicators for the project progress and quality, and it should be considered and supported in the implementation of the software development methodology (Ghilici-Micu, et al., 2014).

The testing processes are usually derived from user stories. User stories are means of communication with end-users and customers and serve as the basis for developing system-related functions. One of the main goals of user stories is to describe the functionality of the software from the user’s point of view. Each user story is developed to test at least one rule and assigned to a set of test cases that execute the required steps, assuring that application or software under test is working properly, as expected.

This project is the first part of a wider process that supports automation during the software testing. The objective is to shorten the run time of the testing that covers a set of user stories. A mapping process analyses a user story and assigns it to the relevant testing scripts, using artificial intelligence (AI) algorithms, such as Natural Language Processing (NLP). We applied three analyses using the LIPS algorithm proposed by Soeken and Drechsler (2016): syntactic, semantic, and pragmatic. The outcomes of these processes provide the main part of the speech tagging, and suggest chains of words that are used to search the testing scripts files for maximum compatibility.

2. Objective

Software testing is a process, or a series of processes, designed to verify the degree of execution of source code as it is designed to do. The software must be predictable and consistent, without surprises for the users. A complete test can never be performed, not only in theory but also in practice.
There are two ways to test software: Automated Testing and manual Testing (Ghilic-Micu et al., 2014.).

The testing process is a very expensive part of the software development process, it is sometimes estimated at 50% of the entire cost of the development. This is one of the main activities in development methods that support quality assurance such as Agile methods. These led the testing area to the software development center, with emphasis on techniques such as continuous integration and test-driven development, in which a certain form of testing occurs continuously (Berłowskia, et al., 2016, Rane, 2017).

In all tests types, it is necessary to plan and formulate the policy and the examination process. The design of the tests is usually done in the STP document and it is recommended to start planning the tests sufficiently in advance so that the project can be managed efficiently and organized for the testing process.

After this stage, the task division stage begins. At this stage the tester's team constructs, establishes, and manages the database of test scripts. Typically for new scenarios new scripts will be created and the group will try to search for existing scripts and reuse them even if there are a few changes.

The problem arises when it takes a long time to locate the scripts from the past and in others cases not even find them. As a result, a lot of time is wasted for members of the group who are responsible for matching the tests to the user's stories, in addition to not making proper use of scripts already written. This causes the testing team to write new test scripts for the user stories that do not have a suitable test script; these actions take considerable time, prolong the sprint, and in worse cases inhibit the production of the end product for the customer.

The purpose of the system is to automate the process of locating test scripts that have been written in the past and can be reused in a useful way for the tests team, shortening the time allotted for writing the test scripts, and reducing the manpower allocated to the system tests. When the system finds a test script – it can be in one of three modes:

1. The user story has a test script that can be run automatically,
2. The system has a test script that can be run manually – human,
3. The user story does not have a test script at all and we want to create it – this section is a part of the future development system.

When you load an Excel file, the system will analyze the features and the Acceptance Criteria, extract the most significant words in the text – noun and verb, search for two meanings, search for synonyms, create a dictionary for them, and search for them (see Figure1).
3. Results, Discussion and Conclusions

Testing the system for real data from the external environment showed finding adjustments of 40%. This value was obtained mainly from the difference in size between Test Data and Feature Data. From the feature analysis we received a series of verbs and nouns that we had to compare with a series of verbs and nouns from the current test. The size of the feature data was about 50, while the test data ranged from 4 to 10 words.

In order to deduce the causes of the results we obtained, we compared data from which we received low accuracy percentages and data from which we received high accuracy percentages. From the analysis performed we could see that we did receive high accuracy results for data with more detailed text.

From this we concluded that in order to increase the accuracy of the system, it is necessary to enforce the writing of the test authors. In addition, it appears that the current mapping lacked the meaning of a dictionary of words given by the relevant company and the introduction of this dictionary is part of the vector construction data. This part can significantly increase and give a different connotation to the dictionary of words for each data item.

Further development of the system, beyond the possibility of a system that will automatically create the test scripts based on Soeken and Drechsler's book (2015) is to increase accuracy to higher levels and refine the current system so that you can accurately obtain the tests belonging to the current data.

References


SUSTAIN-ALL LANGUAGE LEARNING

Complete Research, Research in Progress

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Keywords: Computer Assisted Language Learning, language learning systems, human computer interaction (HCI).

1 Introduction

The enetCollect COST (European Cooperation in Science and Technology of the European Commission) action addresses the major European challenge of fostering the language skills of all citizens regardless of their diversified social, educational, and linguistic backgrounds. To this end, the Action is concerned with the domain of Language Learning and focuses on enhancing the production of learning material in order to cope with the increasing demand for language learning and the striking diversification of learner profiles.

EnetCollect addresses this challenge by performing the groundwork to set into motion a Research and Innovation trend combining the well-established domain of Language Learning with recent and successful crowdsourcing approaches in order to unlock a crowdsourcing potential available for all languages and trigger an innovation breakthrough for the production of language learning material. EnetCollect approaches this objective by building an international and interdisciplinary R&I community, creating a comprehensive theoretical framework and running prototypical experiments.

EnetCollect also aims at simultaneously crowdsourcing language learning material and language-related datasets in order to attract language-related Research and Innovation players.

Such an IS has to integrate the following features:

- edutainment
- gamification
- Computer Assisted Language Learning (CALL)
- Individual Customization

We describe here a very important IS for Language Learning – a pan-European network of story-based distributed crowdsourcing intelligent knowledge base for language learning – SUSTAIN-ALL.

Furthermore, we provide insights on how such an IS could be implemented by using already deployed Games With A Purpose like Knowledge Coder (Rodosthenous & Michael, 2014) or its successor Robot Trainer (Rodosthenous & Michael, 2016).
2 Gamified Crowdsourcing AI Language Learning IS (G-CALL-IS)

G-CALL-IS – Gamified Crowdsourcing AI Language Learning Information System is a network architecture of servers, knowledge bases, linguists, educator experts, content providers, teachers and prosumers (the student being both producer and consumer) of learning material.

G-CALL-IS integrates into one extremely powerful Information System the major tools and most useful methods of:

- Gamifying
- Crowdsourcing
- AI
- Language Learning educational and linguistic Knowledge
- Web 2.0

G-CALL-IS - Gamified Crowdsourcing AI Language Learning IS is the holy grail of current R&D. It includes both intelligent architecture and intelligent life-cycle (Rosenberg & Zviel-Girshin, 2003).

3 SUSTAIN-ALL

SUSTAIN-ALL - from Story Understanding to Story Telling AI Network of All-European Language Learning is G-CALL-IS that is story oriented.

Story is central to language learning. It makes it better and more interesting. No language learning can be complete without story understanding and storytelling in L2 (Lucarevschi, 2016; Isbellet al., 2004). Even for L1 it could improve user’s knowledge. And story can become a very good basis for production of learning material. Creating stories for language learning would be an extremely fruitful endeavor.

Architecture for creating, analysing and improving database of stories (especially in a computer readable form and including meta data) would dramatically enhance production of learning material for language learning. Such architecture is presented here – the G-CALL enetCollect playground.

Story games suite of the G-CALL playground would include, among other:

- story understanding in L1
- storytelling in L1
- story understanding in L2
- storytelling in L2

In addition to the immediate advantages of learning by the users, the added value includes such important achievements as:

- models of the users
- model of clusters of users
- database creation of learning content
Knowledge Coder is a game implementing the SUSTAIN-ALL principles and with some modifications in the game mechanisms, it can help towards gathering stories and story related information in any language. It can also be used to annotate stories. The game is available online at (https://cognition.ouc.ac.cy/knowledge_coder) thus creating the first exemplification and embodiment of the SUSTAIN-ALL network.

4 Knowledge Coder - A Game With A Purpose

Knowledge Coder is a Game With A Purpose (GWAP) designed to facilitate experiments on knowledge acquisition using crowdsourcing techniques. The General research problem this game tries to tackle is that of the acquisition of Background Knowledge to be used by an automated story understanding system. The approach taken is to develop a method/system to facilitate knowledge acquisition using crowdsourcing techniques. More specifically, this game uses a specific methodology that breaks the knowledge acquisition task into a sequence of more specific tasks, so that human participants not only identify relevant knowledge, but also convert it into a machine-readable form, generalize it, and evaluate its appropriateness.

The games use the output-agreement games template, that requires players to agree on the same output they produce. The game plot takes place in the near future, where Planet Earth is captured by alien forces capable of intercepting human communications in natural language. Players are asked to join the resistance forces and help their co-defenders encode human knowledge in a form that is not readable by aliens, and thus guard it from being intercepted.

Players are encouraged to play using competitive motives. For each successful mission attempt, players are rewarded with points that are added to their total score. Players are also rewarded with extra points when other players contribute and verify the former players’ mission results and vice versa. These extra points are used to separate the knowledgeable and honest players from the rest. After a player reaches a certain score, an award is issued and added to the player’s profile. These methods are commonly applied techniques to encourage and promote competition among players in games.

The developed methodology comprises of six steps, casted as game missions. Detailed description of the game can be found in the work of Rodosthenous and Michael (2014).

5 Conclusions and Future Research

Knowledge Coder is only one of the many approaches that can be used in the SUSTAIN-ALL IS. We need a variety of games and crowdsourcing applications built as G-CALL-IS. The future applications and games will have a very sophisticated network and life-cycle.
We have assembled a great corpus of Story-based English Language Learning (SELL). It has now to become available to all users through online gamification integrated into the SUSTAIN-ALL IS.

Further research will develop AI mechanisms for reading, understanding, creating the stories knowledge base for a better enetCollect content and processes. The ever-evolving knowledge of the individual user will be processed and incorporated into the IS.

The knowledge base of SUSTAIN-ALL IS is to be updated in a significant part by crowdsourcing. Through crowdsourcing the process of understanding, answering comprehension tests questions, analysing, metadata creation and the process of creating the stories will grow the knowledge base. The student will become a prosumer (both producer and consumer, often simultaneously) of the stories and meta-data.

There is a need for a special SUSTAIN-ALL IS life cycle of building and refining the stories knowledge base, the games, model and process constantly to produce an evolving ever improving network.

SUSTAIN-ALL IS will become in the next years a major force for improving dramatically the life and mutual understanding of languages and cultures of Europe.

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References


Session 2b: 12:05 – 13:25
Chair: Dizza Beimel

List of Papers

1. Social Media to Promote Wellbeing of Chronically Ill Patients: Wisdom of the Crowd for Personalized Recommendations, Maya Stemmer, Gilad Ravid and Yisrael Parmet

2. Willingness to Join a Smartphone-Based Emergency Response Community – Evidence from a Field Study, Michael Khalemksy, David Schwartz, Tamar Silberg, Anna Khalemksy, Eli Jaffe and Raphael Herbst

3. The Information Content of Multi-Word #Hashtags, Zvi Ben-Ami, Tomer Geva and Inbal Yahav

4. Productivity Paradox to Productivity Orthodoxy, Paul Licker, Arik Ragowsky and David Gefen

5. The Effect of Distributed Production of Information on Value Perception, Yonit Rusho and Daphne R. Raban
Introduction

Social media are increasingly used for communicating and disseminating information. They connect people all over the world at any given time, and allow their users to interact and collaborate with each other. They serve as an alternate information source for patients, who use them to learn from each other’s experience and provide social support (Asamoah 2016, Buchanan, Coulson 2007, Capozza, Shao et al. 2016, Frohlich, Zmyslinski-Seelig 2012).

These social media are therefore a form of collective wisdom, which can be used for inferring public opinion and making predictions. They also play a big role in the field of recommender systems, as they constitute both data sources and marketing platforms for providing recommendations (Asur, Huberman 2010, Gundecha, Liu 2012, Hu, Liu 2012, Tang, Liu 2010).

Though a lot of research has been devoted to the exploration of recommender systems algorithms and their use in various domains, recent literature is still lacking in research of utilizing social media data to provide recommendations regarding health and wellbeing.

Objectives

The aim of this research is to assess the feasibility of using social media data to promote wellbeing of chronically ill patients, by providing them with personalized recommendations for healthy lifestyles based on the wisdom of the crowd. We wish to develop a model for mining social networks to construct a recommender system suggesting lifestyle changes based on the experience described in patients’ posts. We seek to leverage posts describing a patient’s daily activities and their influence on her wellbeing for characterizing different treatments and understanding what works for whom.

Research Methods

For the purpose of demonstrating this approach, Twitter platform, which is used for disseminating health related information and sharing personal experience, was selected. Inflammatory Bowel Diseases (IBDs) were also chosen, as their characteristics emphasize the importance of analyzing the data gathered by patients outside the doctor's office. IBD is a chronic condition which cannot be cured.
through medications or surgical procedures. Treatment options can only help with symptoms and they affect each patient differently. They include daily drug consumption and lifestyle changes such as physical activity and special nutrition.

In this research, Twitter data related to IBD will be collected and analyzed in three main stages: First, a classifier of IBD related entities will be developed, which will allow for the analysis of patients’ tweets. Then treatment options will be characterized and their effectiveness will be assessed based on the patients’ sentiment towards them. This will serve as a basis for building a recommender system suggesting lifestyle changes to patients. Finally, patients’ entire timelines will be collected and analyzed, to discover how the disease affects patients’ lives and alters their habits.

To support research feasibility, a preliminary research was conducted to become convinced that there is indeed a community of Twitter users who address IBD and to identify the kinds of information they share in their tweets. A week of IBD related tweets was collected using Twitter Search API, and the authors of the tweets were reviewed. A user x who frequently tweeted about IBD was identified, and his friends and followers were collected. The process was repeated for a small fraction of friends and followers who also had a connection to IBD (i.e. tweeted about IBD themselves or were mentioned in a tweet about IBD). Gephi software was used to construct the obtained network of Twitter users. After reviewing his Twitter profile and confirming that x is indeed an IBD patient, his entire Twitter timeline was collected and read carefully. A total of 985 tweets (including retweets) from July 2009, when he created his Twitter account, until January 2018 were read and analyzed. Depending on its meaning and the words it contained, each tweet was labeled as Directly Related to IBD, Related to IBD by Context or Not Related to IBD.

4 Initial Results

IBD patients openly tweet about their disease and form a supportive community by following one another on Twitter. They consult about treatments (“Do any IBD people have experience with/heard of Golimumab for UC? It's a biologic and I'm thinking of giving it a go!”) and share personal experience; they exchange recipes or thoughts about special diets (“I eat bananas & never linked it any issues like spinach season seems to kick off a flare, but not a cure or big help.”); and recommend relaxing physical activities like meditation or yoga (“I am living proof that yoga can help #uchicagoibd #studiothree #yoga #ibd”).

The analysis of patient x timeline revealed interesting information about his disease and the way it affects his everyday life. He was diagnosed with Ulcerative Colitis (UC) in December 2011, at the age of 31, after a year and a half of being misdiagnosed with Irritable Bowel Syndrome (IBS). he has a comfortable diet while in remission, but his alcohol consumption habits were affected by the disease. He mentions that he works from home, which suits the nature of IBD, and openly declares his disease in his Twitter bio. In total, 26.90% of his tweets involved IBD: 14.21% directly (by including relevant keywords) and 12.69% indirectly (were relevant by context).

5 Conclusions

Patients use social media to seek guidance from others and for sharing personal experience. They exchange thoughts about symptoms and recommend treatments to one another. Aggregating and
analyzing these informative conversations may shed some light on patients’ ways of life and support the research of chronic conditions.

The construction of the recommender system described above can also provide a theoretic contribution to the fields of text mining and social network analysis. New algorithms for automatically collecting and analyzing Twitter data in massive volumes will be developed, and existing technologies of opinion mining and recommender systems will be adjusted to the context of wellbeing.

References

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WILLINGNESS TO JOIN A SMARTPHONE-BASED EMERGENCY RESPONSE COMMUNITY - EVIDENCE FROM A FIELD STUDY

Research in Progress

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Keywords: mHealth, smartphone-based community, adoption of information systems.

1 Introduction

Emergency Response Communities

Medical emergency is 'an acute injury or illness that poses an immediate risk to a person's life or long-term health' (Ramanayake et al., 2014). Non-trauma medical emergencies include conditions such as stroke, acute asthma, myocardial infarction, anaphylactic shock, etc. Fast first-aid is crucial for lowering mortality and improving prognosis (Hansen et al., 2015; Hasselqvist-Ax et al., 2015).

Emergency Medical Services (EMS) are the primary provider of first-aid. Response times of EMS vary significantly between countries and geographies (Chanta et al., 2014; Roudsari et al., 2007; Waseem et al., 2011). Health policy makers try to achieve faster response through various approaches, such as deployment of automatic defibrillators in public places, use of drones to deliver emergency equipment and establishing networks of volunteers to provide first aid etc. Emergency Response Communities (ERC) for anaphylaxis proposed by Schwartz et al. (Schwartz, D. G., Bellou, A., Garcia-Castrillo, L., Muraro, A. & Papadopoulos, N. G., 2014) is based on a social network of patients who are required to carry life-saving medications and can help each other in case of absence of the medication when a sudden attack occurs. Central servers track the location of community members and contacts members carrying the required medication and are close enough to the patient in distress.
Different aspects of the decision to join an ERC

The willingness to volunteer can be studied from two perspectives – different characteristics: demography, health, etc. that predict someone’s voluntary action participation; and motives to volunteer such as self-actualization, need for mutual support, self-esteem, etc. Altruism is the most frequent reason for volunteering (John C. Anderson and Larry F. Moore, 1978), but people may volunteer for reasons other than pure altruism (Lancy and Nattiv, 1992). The phenomena of ‘bystander intervention’ has been vigorously studied over the past decades (Bennett et al., 2014; Latane and Darley, 1970, 1968; Latane and Rodin, 1969; Wissenberg, 2013).

Mutual aid communities and societies of patients exist in different areas such as among addicts (Atkins and Hawdon, 2007; Magura, 2008), mental health patients (Hyde, 2013; Magura, 2008), diabetes patients (Gilden et al., 1992; Simmons, 1992), etc. An important phenomenon that may influence the willingness to join an ERC is "shared identity" - people tend to help those who share something in common with them (Levine et al., 2002; Piliavin et al., 1969; Shostak and Fox, 2012). ERC members share the same medical condition and may be influenced by this phenomenon.

Joining an ERC requires adoption of a dedicated smartphone app. Adoption of mobile apps was intensively studied during the last decade in general and specifically among patients (El-Gayar et al., 2013; Leijdekkers and Gay, 2013; Melzner et al., 2014; Murnane et al., 2015). Previous studies identified factors that influence the adoption of mobile apps by patients (Deng et al., 2014; Dwivedi et al., 2016; El-Gayar et al., 2013; Kotlyar and Arnold, 2006; Torsi et al., 2009; Venkatesh et al., 2003).

Joining an ERC community requires readiness to share personal prescription medication with a stranger. Previous studies reported wide range of prevalence of sharing of prescription medications (5%-52%). Several studies have found that gender, age, income and use of the Internet to access health related information, influence the willingness to share medications (Beyene et al., 2014).

The EPIMADA project

The EPIMADA project was launched by the Israel national EMS – MADA (Magen David Adom) in cooperation with Bar-Ilan University, for allergy patients who are prescribed to carry an AAI (Automatic Adrenaline Injector) which is the first line of treatment for anaphylaxis (Kemp et al., 2008). Patients who join the community are equipped with a mobile app that tracks their location and notifies them about relevant emergencies in their proximity. The dispatch of the community members is managed by the central command center of MADA.

2 Objectives

Our objective was to identify the factors that influence the willingness to join a smartphone-based Emergency Response Community for allergy patients.

3 Methods

We used a convenience sample of patients and parents of patients that attended an annual meeting of a non-profit food-allergy organization. All participants were asked to fill questionnaires that included brief description of EPIMADA project followed by questions about demographic factors, condition-
related factors, questions about the willingness to join the ERC and the minimal age to join an ERC. We collected 74 parents’ questionnaires and 23 children questionnaires (response rates about 95%). The analysis is performed in SPSS. A dual parent-child IRB-approved consent protocol was followed.

4 Initial Results

The willingness to join was very high among parents (95%) and lower among children (78%). The likelihood of parents to join the community was affected by parent's age, parent's education, child's age, parent's adherence, child's adherence, time from the last anaphylaxis attack and child's gender.

About 49% of parents agree that their children join an ERC. The main factor is if the parent carries an AAI, followed by child's age and child's adherence.

Opinions about the minimal age to join an ERC vary slightly between parents (average 12.21, CI (p=95%) 11.46 – 12.95) and children (average 13.15, CI (p=95%) 11.63 – 14.67). Parents’ opinions were affected by child's age, over-protective parental style and parent's education.

5 References


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EVALUATING HASHTAGS

Research in Progress

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Keywords: Multi-word hashtags, Sentiment Analysis, NLP, Social Networks, Twitter.

1 Introduction

Online social networks provide us with many opportunities to observe new social behaviors and social phenomena (e.g., Bapna and Umyarov 2015; Susarla et al. 2012). One such interesting phenomenon is the use of hashtags, which had become prevalent in recent years (Huang et al. 2010). While the original intention of hashtags in social networks (such as Twitter, Instagram, Facebook) was merely to provide bookmarking for search mechanisms, in effect, users often use hashtags to emphasize important content and focus reader attention (Huang et al. 2010; Yang et al. 2012). Examples are #metoo, #fakenews, #happycustomer. In this sense, hashtags can be potentially regarded as a modern equivalent of underlining important text.

This work focuses on gauging the informativeness of such hashtags in social networks for large-scale sentiment analysis. Mainly, we are interested in the informativeness of the widespread multiword hashtags, which challenge automatic text mining tools. This is because unspaced phrases, which are easily broken down into words by humans, are difficult to handle by automated mechanisms. In effect, many previous studies simply ignored hashtags altogether when applying automated content analysis methods (e.g., Nichols et al. 2012; Kumar et al. 2015). Other studies regarded hashtags as a standard vocabulary term, even in the case that the hashtag consists of several unspaced terms (e.g., Sidarenka et al. 2013; Tsur & Rappoport 2012). Whereas, a few studies did attempt to decompose the hashtag into its terms (e.g., Deveaud & Boudin 2013; Maynard & Greenwood 2014). However, these studies did neither consider the importance of the actual tagging action, which aims at highlighting the tagged information nor did they evaluate whether the decomposed terms in the hashtag are informative.

To evaluate hashtags’ informativeness, we first develop a linear programming-based algorithm for accurate term identification in an unspaced phrase and utilize it to split hashtags within user generated content (UGC) in social networks. We then examine whether the finer-grained interpretation of such hashtags as well as emphasizing the hashtag content is informative for improving the accuracy of sentiment analysis. We use a renowned twitter sentiment dataset and provide an extensive evaluation of the informativeness of such hashtags across multiple settings.

To our knowledge, this work is the first to evaluate the information content of hashtags for sentiment analysis. Our results show that hashtags and in particular multiword hashtags are highly informative for sentiment analysis. Given the importance of sentiment analysis for large-scale customer understanding, customer monitoring, and user behavior prediction, combined with the fact that
companies often perform costly data enrichment efforts -- our results show that utilizing the information content of hashtags is a "low hanging fruit" that can be readily used towards improved sentiment analysis.

2 Experiments

It is hard to obtain a reliable large-scale annotated sentiment analysis training data of social messages with multiword hashtags. Some smaller scale, hand-labeled, datasets are, nevertheless, publicly available. In order to evaluate the hashtags’ informativeness for sentiment analysis, we used the well-known “airline sentiment” dataset from Kaggle\(^1\). In this dataset, each Tweet is labeled as positive, negative or neutral. In the original dataset, there are 14,641 Tweets. Out of which 2,324 contain hashtags and were used in our experiments (1,333 Tweets include multiword hashtags).

For our experiments, we first preprocessed our dataset by removing non-alphabetic and non-numeric characters. We then generated a feature vector of “word” frequencies for each Tweet. In our baseline representation, we regarded any sequence of text separated by white spaces as a “word”. We then compared the Area under the Curve (AUC) of sentiment analysis models using the baseline representation and the added benefit of splitting multiword hashtags into single words. For this purpose we first apply our linear programming algorithm to split unspaced phrases in the hashtags. We then represent each word in a Tweet as well as split hashtags as “word” features. To classify the tweets we used a Random Forest classification algorithm in conjunction with both of the above tweet representation scenarios.

2.1 Preliminary results

Our preliminary results shows a significant improvement in AUC when separating the hashtags compared to the baseline, using a 10-folds cross validation.

We further experimented our model on additional two publicly available corpora (Sanders Twitter Sentiment corpus and SemEval-2013 Task 2 corpus). These experiments produced similar results in terms of AUC improvement. This suggest that hashtags contain important content that needs to be extracted.

Experiments using an SVM classifier instead of a Random Forest classifier also showed improvement in performances when separating multiword hashtags. Overall, the results of our experiments clearly indicate the informativeness of multi-word hashtags.

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\(^1\) [https://www.kaggle.com/crowdflower/twitter-airline-sentiment](https://www.kaggle.com/crowdflower/twitter-airline-sentiment). The data originally came from Crowdflower's Data for Everyone library.


PRODUCTIVITY PARADOX TO PRODUCTIVITY ORTHODOXY

Research in Progress

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Keywords: Users, Productivity, Organizational IT Maturity, user Effort, User-IT Communication, User Relations.

1 Introduction: How Does IT Increase Productivity

In the 1980s and 90s, it appeared that huge investments in information technology were not paying off in productivity increase (Brynjolffson, 1993; Brynjolfson and Hitt, 1998). This was termed the “productivity paradox”. But by 2010, it became part of IT orthodoxy that no organization could fail to invest in IT if it wanted to remain competitive. We know quite well now that IT has enormous positive effects on organizational performance. Nonetheless, two nagging questions remain. First, if IT is valuable now, why wasn’t it valuable 28 years ago? Were the tools simply not that good? Or were they not being used well. Second, if it isn’t merely tool quality, then what makes IT valuable (Ragowsky, Licker and Gefen, (2008)?

This paper addresses that question of what turns investments in tools into performance of the organization, i.e., what capabilities, inclinations and opportunities are needed by the user in order to successfully apply the tools’ capabilities towards organizational goals?

Clearly how well tools are used and how well tools perform are the guiding influences here. The quality of the use must depend on the users’ efforts in learning how to use them and users’ care put in using them. Also, the quality of the tool depends on the appropriateness of the tool in turn depending on the quality of the communication between users and IT providers. These ideas have led us to consider that the benefits of tool use might depend as well on how mature the organization is in its orientation towards information and IT. More awareness of the value of information, more understanding of and willingness to invest time, money and effort in the necessary IT and higher levels of trust in the IT tool delivery process (and mutual trust of the users and IT providers) should make it possible for the benefits of IT-user communication and user effort to use the tools well to appear and to be felt.

In the early days of modern IT, this kind of maturity was lacking and it is likely that the only way that benefits of tool use could be obtained was through individual user effort in applying the tools to business processes. With only moderate application effort, investment in tools would not lead to the expected payoffs, hence the “productivity paradox”. Today organizations are generally more “mature” in this sense; moderate application effort and better communication between IT and its users will lead to bigger payoffs, hence the “productivity orthodoxy”.
2 Research Questions

In this research, we developed a set of hypotheses linking the two aspects of user behavior mentioned above (user effort and user-IT communication) with traditional measures of outcomes of IT usage (perceived productivity and perceived value of IT). Our research then shows that positive relations among these are mediated by the level of Organizational IT Maturity (OITM – (Ragowsky, Licker and Gefen, 2012)), or the level of maturity of the orientation of the firm towards its information and information technology, progressing through higher levels of awareness of the value of information, understanding of the role of information technology in the business and mutual trust between IT users and IT people.

Our hypotheses are as follow: Increasing quality and quantity of communication between IT people and users will increase levels of OITM. Increasing user effort to use applications well will increase levels of OITM. Increasing the level of OITM is associated with positive perceptions of the IT unit and of the users’ performance. Increasing levels of communication and user effort will independently increase perception of the IT unit and users’ own performance.

3 Research Methodology

For this research, we conducted interviews and solicited survey data from two Midwestern large US industrial firms. Using internet-based questionnaires 700 users provided responses concerning communication with the IT unit, user effort to learn and improve applications, awareness, willingness and trust, and outcomes such as the perception of increased performance with IT tools and the quality of the relationship with the IT unit.

4 Preliminary Results

Confirmatory factor analysis showed that these factors were coherent and valid. One-way ANOVA was used to determine the effects of the independent variables (communication and effort) and intervening variables (OITM: awareness, willingness, trust) on the dependent variables (performance and relationship).

Pearson r statistics were calculated for all correlations. Multiple regression showed the impact of the independent variables on the dependent variables while partial correlation was used to demonstrate the disappearance of three of these influences with OITM components as the control variables.

All seven indices were significantly correlated. Both communication and effort have positive relationships with performance and relationship. Two of these are expected (communication with relationship and effort with performance) and two are not. When we control statistically for the associations with OITM indices, only that of effort with performance remains statistically significant.
5 Preliminary Conclusions

While user effort at mastering IT can pay off in performance, communication pays off better (by 50%) through influencing the components of OITM. It does this by (1) increasing understanding and trust which in turn allow IT people to develop appropriate tools and allow users to have more confidence in their use of these tools and (2) helping improve relationships with the IT people, which shifts the focus of users’ efforts from coping with these relationships to applying their mastery of tool skills to the work situation. These in turn improve productivity as well as the relationship with the IT unit.

It seems, therefore, that when OITM levels are low, only user effort to learn and apply IT tools has any chance of increasing payoffs such as perceived increased performance. As OITM levels rise, both user effort as well as interaction with the IT unit will have leveraged, higher payoffs. In the presence of less-than-user-friendly tools of the 1980s and early 1990s, low OITM meant that huge user effort was required to gain productivity increases; no amount of user-IT communication was helpful and hence productivity seemed paradoxically low for the IT investment. As more organizations become more aware, willing, and trusting, the better tools of the 21st century can be used far more advantageously through user effort and communication with the IT unit (to get the appropriate tools). Hence IT for productivity becomes the orthodoxy.

This research is only preliminary and a number of improvements need to be made. While the unit of analysis of this research is the individual user, OITM is a concept best applied at the level of the organization. In our research we elicited responses from users in only two organizations. Future research should be performed soliciting data from organizations (CIOs and CEOs) as well as users in those organizations.

Finally analytic methods such as SEM would be better applied to the data in order to verify the causal relations inferred from the regression analysis.

References

THE EFFECT OF DISTRIBUTED PRODUCTION OF INFORMATION ON VALUE PERCEPTION

Research in Progress

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Keywords: Information production; Information peer-production; Information evaluation

1 Introduction

Information is known to be an experience good, meaning that consumers need to acquire and use information in order to assess its value. This traditional approach has not considered another form of experience which has become prevalent since the advent of the Web, namely, the experience of producing information. Information production is done either in solitude or as part of a collaborative endeavour, also known as peer production (Rychwalska & Roszczynska-Kurasinska, 2017). We examine how engaging in information production affects value perception by individuals producing on their own or as part of a distributed peer production environment.

We define two types of information experience: consumption and production. Consumption is accomplished by individual exposure to information. Information production is a value-added process described as a five-stage cycle, earlier suggested for software production by Kotonya and Sommerville's (1998): (1) specification (2) design (3) implementation (4) validation (5) evolution. We adapt the cycle for the case of information production and apply it as part of our experimental setup.

The fundamental assumption in this research is that value perception may change as a result of engaging in production. This assumption comes from recent research which coined the “Ikea Effect”, showing that value is perceived as higher when people engage in making physical objects (Norton, Mochon & Ariely, 2012). The current study applies the Ikea Effect theory from the physical world to the production of digital information goods. Furthermore, this study examines the boundaries of value perception when peer production comes into play.

In order to assess the value associated with experience, value measurement needs to be performed before and after engaging in the consumption and production experiences at the individual and distributed peer-production scenarios. In this study we compare before-after value differences perceived by individual consumers and producers.

Following are the research hypotheses:

H1: Information consumption and production experiences have equivalent perceived values before the experience

H2: Production experience of information is associated with higher perceived value post experience than consumption experience

H3: Value perception post production is higher than before the production
2 Method

309 participants took part in a set of experiments. The subjective perception of information value (Raban & Rafaeli, 2006) is measured by willingness-to-pay (WTP) by consumers and willingness-to-accept payment (WTA) by producers, based on the incentive-compatible BDM method mechanism (Becker, DeGroot & Marschak, 1964). Participants were randomly assigned to one of the following groups: single consumer/producer, information evaluation before/after experiencing information. In the consumption experience group, participants read a brochure with information about Web Accessibility. In the production experience group, participants created the same information described above.

3 Results

Results show that consumers’ and producers’ subjective value before their experience were equivalent. (Consumers: N=55, mean rank: 235.04. Producers: N=52, mean rank: 245.27). H1 was accepted. Change in value perception before and after consumption/production produced a statistically significant effect \( p=.015 \) (consumers: N=55 positive change 47.03; producers: N=52 positive change 61.38). H2 was accepted; Producers who evaluate the information after the experience, evaluated it higher than producers who evaluated the information before the experience \( (p=.000) \). Evaluation before: N=52, average value: 245.27. Evaluation after: N=27, average value: 1544.48). H3 was accepted.

4 Discussion

The "Ikea Effect" for information goods shows that production affects value perception, namely, labor combined with time, put into information production process is translated to perceived value of information. This study offers a hint toward the practical design of new information products, and eventually information markets. In such products and markets the borders between reading and writing, listening and composing, watching and film-editing will blur by design in order to cater to the enhanced value possible by mixing experiences. Future work will examine peer effects on consumption and production as well as direct mutual effects of production on consumption of information.

References

Session 2c: 12:05 – 13:25
Chair: Irena Milstein

List of Papers

1. What Competencies are Needed for Data Analytics? - A Delphi Study, Orli Weiser, Yoram M. Kalman, Carmel Kent and Gilad Ravid

2. Data Mining Implementations: Multiprocessor Architecture vs. Hadoop Distributed Computing Architecture, Dror Ben Ami

3. Bringing Big Data Analytics to the Physician Desk Using the Work System Theory, Tsipi Heart, Nir Shlomo and Ofir Ben-Assuli

4. Computational Approach to Bias, David Bodoff

5. Process Mining in Maman Cargo Release Handling Services, Sagit Kedem-Yemini
WHAT COMPETENCIES ARE NEEDED FOR DATA ANALYTICS? - A DELPHI STUDY

Research in Progress

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Keywords: big data, data analytics, competencies, Delphi technique, Q methodology, CRISP-DM model, virtual lab.

1 Introduction

Recent developments in digital technologies open up exciting opportunities for social science research and for organizational decision making. Labels such as "big data" describe the potential of analyzing digital records created on and collected by information systems. The ability to collect digital records, analyze them and effectively communicate the findings is emerging as a key competency set for researchers in the social sciences, and for practitioners in organizations of every size. Thus, teaching data literacy skills is an important goal for academic institutions.

In order to deal with these challenges, we are developing a data-analytics student lab. This project will provide undergraduate and graduate students with a virtual "lab bench" where they can access datasets, analysis and visualization tools, as well as structured methodologies on how to carry out lab experiments and observational studies. This lab will incorporate elements from virtual labs used in science education (Heradio et. al., 2016). The lab will enable faculty to develop data analytics exercises, allow students to carry out these experiments/analyses, allow researchers to track and monitor student activities and apply learning analytics to assess each student's performance while providing personalized feedback.

In the course of developing this student lab, we were confronted with the question of what are the learning outcomes this lab is supposed to support. A review of the literature revealed the lack of a contemporary conceptualization of the skills and capabilities required for data analytics in the context of computational social science (Lazer et al., 2009). Hence, we set out to develop a description of this competency set by conducting a Delphi study focusing on the competencies needed for data analytics and computational social sciences.
One key resource for this conceptualization are "21st century skills" frameworks (e.g. Eshet, 2004; Pellegrino & Hilton, 2012). These frameworks include cognitive, intrapersonal and interpersonal competencies required for being productive contributing citizens and professionals in the current and future knowledge society. Additional resources are the AIS "IS 2010 Curriculum Guidelines" (Topi et al., 2010) and the "Innovating Pedagogy" report which explores new forms of teaching, learning and assessment for an interactive world (Ferguson et al., 2017).

2 Research Methods

The Delphi technique is a structured process that uses a series of questionnaire-based rounds to gather information from a chosen panel of respondents within their domain of expertise, until group consensus is determined to be achieved (Dalkey & Helmer, 1963). In the traditional Delphi study, the first questionnaire is based on an extensive review of the literature. During the years, additional applications of the Delphi technique were developed. The most popular of them is the Modified Delphi technique, which is similar to the traditional Delphi technique in terms of procedure and intent, but can also involve interviews and group interaction and ignore the anonymity rule kept in the traditional Delphi technique (Custer, Scarcella & Stewart, 1999). The modified technique is applicable to goal settings, for policy investigation and for predicting future events (Hsu & Sandford, 2007).

The current study will be based on the Modified Delphi technique. The first round will include a questionnaire developed by the research team, based on a literature review and on exploratory interviews with a small number of experts. Following the questionnaire development, 50-70 experts will be invited to participate in the study. The anonymity of the experts will be kept, and their identity will be known to the research team only. The experts will be chosen according to a detailed list of criteria, including place of work and research, field of work, gender, education, professional experience, domain of expertise and willingness to commit to responding to several rounds of online questionnaires. The Experts will be recruited from industry and academia, and their expertise will represent all six phases of data analytics according to the CRISP-DM model [a "Cross-Industry Process for Data Mining" model that breaks the process of data mining into six major phases: Business understanding, Data understanding, Data preparation, Modeling, Evaluation and Deployment (Chapman et al., 2000)].

The questionnaire that will be sent to the experts in the first round will detail cognitive, intrapersonal and interpersonal competencies from the Pellegrino & Hilton model (Pellegrino & Hilton, 2012), as well as additional competencies identified in the literature described in the Introduction section. The respondents will be asked to rate the importance of each competency both for novice data analysts and for expert data analysts in the foreseeable future (5-10 years), by dragging and dropping each competency into an appropriate "box" ("Essential competency", "Important competency", "Less important competency", "Not an important competency", "I do not know", "I do not understand this item"). The items will be accompanied by open text questions, in which the experts will be able to elaborate on their responses, as well as add their own opinion and suggestions.

The research team will analyze the replies to each round's questionnaire using "Q methodology". The "Q methodology" is a research methodology within social science in which the individuals perform the measuring rather than being measured (McKeown & Thomas, 2013). It is based on a qualitative but statistical approach which enables discovering discourses concerning how individuals understand the social and environmental worlds in which they live (Barry & Proops, 1999).
The open ended comments will be analyzed too and an updated questionnaire will be sent to the participating experts asking for their feedback to the other experts’ ratings and suggestions, until a consensus will be reached. The final report will include the ranked items, and if necessary, a list of items for which a consensus could not reached.

3 Acknowledgement

This work is supported by the Open Media and Information Lab at The Open University of Israel [Grant Number 20184]. A version of this research in progress paper was presented at ISECON 2018.

References


DATA MINING IMPLEMENTATIONS:
MULTIPROCESSOR ARCHITECTURE VS. HADOOP
DISTRIBUTED COMPUTING ARCHITECTURE

Research in Progress
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Keywords: Data Mining (DM), Hadoop, Distributed computing

1 Introduction and Objectives

More and more companies are using Data Mining algorithms for a wide range of reasons. The main reason is the necessity to find out patterns and data behavior, especially when the data volumes are huge. How these data elements can be processed and analyzed effectively?

What kind of technical architectures are available for these missions? Once we have answers to the questions above, we face with another critical issue: what and which is the "preferred" best architecture for the company's purposes? The research examines two main cardinal and significant industrial and academic objectives:

The first is specifying the main conditions and conceptual-differentiation between "multiprocessor" based-architecture, and "Hadoop distributed computing" architectures. This section regards the "effectiveness" argument. It is focused on the "WHAT/WHICH" architecture is best suited for DM specific algorithm/s?

The second objective copes with mapping and plotting the main arguments, which describe the architectural technical differences. This section regards the "efficiency" and "system-utilization" terms. It is focused on the "HOW", technically, the architectural environments can be established effectively?

2 Method and Ratio

The general algorithms which were part of the research include 5 algorithms:

The research merge and examines few data mining algorithms: clustering, classification and neural networks. The basic concept of Data Mining Clustering assumes that we can find similarities between data elements (Hand et al., 2001; Dunham, 2003). The groups which can be found through the process are called clusters. If points on a graph describe single data elements, we can assume that the closer points are one to each other, the more similar they are. Thus, we can assume that they belong to the same cluster. If the geometrical distance between the points is greater, we can assume that the data
elements do not have "too much" in common, and thus, they cannot belong to the same cluster. So, what is the distance or the magnitude that according to it the belonging of a point to the cluster determines? This is an active check by the automatic computer algorithms, which controls the sensitivities of size and range and other parameters as well. The data mining methods and techniques are classified into two specific descriptive and predictive algorithms subject matters. These techniques and algorithms are described as general data mining concept (Hand et al., 2001; Dunham, 2003). These references reinforce the usage of Hadoop distributed computing as convenient possible technology and architectural environment (Rajendran, 2017; Punekar et al., 2014).

The first architecture is based on one standalone autonomous computer, which would perform all the data analysis process. This standalone machine has several processors, which are working simultaneously, but under the same single computer and operation system. The computer manages its multithreading and other parallelism techniques, but in a very limited source, as a single machine. The second implementation way is based on distributed computing architecture, by using the Hadoop platform; which means that all the stages can run in parallel, by automatic distribution of the algorithms into few servers at once. The job code is split into segments; by Map-Reduce (Rathi et al., 2014) technique, in this case. The number of servers can be specified in advance, but the entire process is highly scalable. Conceptually, the Hadoop distributed computing can save a lot of time, whilst parallelism can be established effectively.

Another significant parameter must be considered: the amounts of the data to be analyzed. The research includes big chunks of data, organized in over than 128MB per one single file: images, databased tables. Hadoop prefers to work with big files, as part of the architectural efficiency.

3 Summary of the findings / Initial conclusions

Table 1 below describes the main comparison arguments, which were considered and measured during the practical research.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Multiprocessors Computer</th>
<th>Hadoop Architecture</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>result</td>
<td>comments</td>
</tr>
<tr>
<td>1 Iterative computations</td>
<td>V</td>
<td>Mostly suited for these computations</td>
</tr>
<tr>
<td>2 Ability to split the process into subprocesses</td>
<td>V</td>
<td>Multithreading</td>
</tr>
<tr>
<td>3 Code Complexity</td>
<td>not complex</td>
<td>usually much simple</td>
</tr>
<tr>
<td>4 Efficiency: Memory</td>
<td>limited</td>
<td>Not limited</td>
</tr>
<tr>
<td>5 Efficiency: CPU</td>
<td>limited</td>
<td>Not limited</td>
</tr>
<tr>
<td>6 Scalability</td>
<td>LOW</td>
<td>Very limited</td>
</tr>
<tr>
<td>7 Architecture availability</td>
<td>V</td>
<td>Relatively expensive</td>
</tr>
<tr>
<td>8 Data segments</td>
<td>not specified</td>
<td>128MB</td>
</tr>
</tbody>
</table>

Parameters 1 and 2, "iterative computations" and "Ability to split the process into sub-processes" regard the effectiveness; the "what"; the concept.
Parameters 3 to 8 regard the **efficiency** and **system utilization**: the “how”.

Most of the parameters show significant advantage for using Hadoop. This architecture is taking place in more and more applications, when huge amounts of data must be analyzed. Hadoop is Eco-System. Its conceptual structure is like natural ecological system, which is built from wide range of components. Each item, each tool in this technical architecture complex, has its own purposes, and the entire tools' set is working together as one complex to implement effectively the entire process. Utilizing effectively the Hadoop environment and its architecture means that we need to know most of the Hadoop tools, their usage, their limitations and their advantages. Just then – we can optimize the processing level of the entire job we need to implement.

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Computational Approach to Bias

COMPUTATIONAL APPROACH TO BIAS

Research in Progress

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Keywords: fake news, bias, social media, news feed, algorithm

1 Introduction

Fake news became famous in the wake of the US presidential election in 2016. The seemingly viral spread and influence of even the most preposterous claims, has captured the popular imagination, and has sparked research interest. On the technical side, researchers have been developing algorithms to detect rumors, or the activity of “bots”, or fake news (FN). At the same time, automatic FN detection may not be the most fruitful way to advance the cause of a well-informed public. Research has already shown that the spread of fake news is not mostly the result of people’s inability to distinguish fake from truthful. Regarding the spreaders, contrary to popular perception fake news does not spread “virally” in cascades among regular people who have been fooled, but via a small number of sites and/or bots that push the story (del Vicario et al. 2016). Regarding the consumption, recipients of that news who “like” it or are influenced by it, are not doing so because they are duped into believing its literal truth. Rather, they are receptive to the message due to confirmation bias, social pressure, cognitive limits, and other forces that magnify one’s echo chamber (Mele et al. 2017; Metzger et al. 2010; Waldrop 2017). For these reasons, merely flagging news as “fake” is unlikely to limit either its spread or its consumption.

The conclusion of a number of leading thinkers is that a more fruitful response to fake news is to facilitate people’s exposure and exploration of various viewpoints:

Labeling (as “fake” or “suspect”) is hardly a cure-all, however… Yale University psychologists … found that when users were presented with a newsfeed in which some posts were labeled as “disputed” by fact checkers, it backfired … a better approach would be [that] the … newsfeed would be engineered to sometimes include stories outside a user’s comfort zone” (Del Vicario, Bessi et al. 2016).

Similar ideas are nicely raised in Lazer et al.’s (2017) call to research. Our work is motivated by this call. Our work is technical; we construct an algorithm. But the idea is not to automatically flag a news item as biased or not. Rather, our approach is to add a signal to each report, which contributes to the reader’s ability to navigate intelligently through the news-related content.

2 Bias

Research in the field of communication has explored various definitions and dimensions of bias (D’Alessio 2000, Entman 2007, Boudana 2016). Distilling the literature, the main aspects include “unbalanced”, “reflects the journalist’s mind”, and “adopts a position”. Each of the three can be approached computationally or quantitatively.

We propose a computational method for the “adopts a position” aspect. The purpose is to convey to the reader that a report reflects a certain position or point of view on the topic. Many topics such as gun
control, abortion, Brexit, Israeli-Palestinian conflict, etc. -- are subject to controversy, with differing interpretations, opinions, and positions on the topic. The differing positions can often be characterized along a single dimension such as for/against, right-wing/left-wing, etc. For each topic, our algorithm discovers the dimension along which the reports differ, and characterizes where each report is positioned along that scale. This allows a reader to explore opposing points of view if he/she so wishes. In this way, our work will help mitigate the effects of our “filter bubble”, sometimes called “echo chamber”.

The Wall Street Journal’s “Blue Feed, Red Feed” (http://graphics.wsj.com/blue-feed-red-feed/) offers similar output for a few topics, using a very different algorithm that is based on whether the people who shared a report were known (through cooperation with Facebook, which knows these things) to be liberal or conservative. Our method is based on the textual content alone.

3 Algorithm

The proposed algorithm is an extension of one developed by Fortuna et al. (2009); similar ideas were also developed by Lin 2008; Gottopati et al. 2013; and De Clerq et al. 2014. Those works assume that there are two outlets such as CNN and Al-Jazeera, each one representing a point of view. For each topic, Fortuna et al. use a known method called kCCA to produce a vector of general topic words. They subtract these general topic words from the words used by each outlet (e.g. CNN or Al-Jazeera) to produce the outlet-specific idiosyncratic words for that topic. Figure 1 shows an example output for three topics.

Running the kCCA algorithm yields two vectors, \( \mathbf{c}_1 \) and \( \mathbf{c}_2 \), which are the general topic words for CNN and Al-Jazeera, respectively. The difference between these two vectors gives us the outlet-specific words:

\[
\mathbf{d} = \mathbf{c}_1 - \mathbf{c}_2
\]

These words typify each outlet's position on the topic.

\begin{table}
\centering
\begin{tabular}{|c|l|}
\hline
\textbf{Topic} & Iran, nuclear, Palestinian, Israeli, Gaza, EU, enrichment, IAEA \\
CNN & EU, Iran, Rice, militant, Ache, diplomats, monitoring, encouraging \\
AJ & resume, Rafaanjani, research, atomic, Russian, sanctions, reference \\
\hline
\textbf{Topic} & Iraq, Baghdad, Hussein, Shiite, trials, insurgents, troops \\
CNN & insurgents, Hussein, attorney, Kember, family, British \\
AJ & shia, Sunnis, occupation, Saddam, rebels, attack, killed, car \\
\hline
\textbf{Topic} & Palestinian, Gaza, Israel, Sharon, Hamas, Abbas, militant \\
CNN & militant, Israel, pullout, missiles, launch, Putin, Beirut, jews \\
AJ & settlers, Hamas, barriers, Israeli, clashes, Hezbollah, farms, suffer \\
\hline
\end{tabular}
\caption{Example output, reproduced from Fortuna et al (2009).}
\end{table}

A limitation of Fortuna et al. is that it assumes a traditional media situation where there is a small number of large outlets, and each outlet is assumed to represent a point of view (on a given topic, or in general). Then, all that’s left is to characterize the words that typify each point of view. The situation is very different in social media, in which many unknown individual users contribute bits of content. This setting suggests a different, more complex goal – to assign each individual post to one of the two (or more) points of view, at the same time that it discovers the two points of view and their idiosyncratic words. For our purposes, the former is the important part – the assignment of each report to one of the points of view that is discovered.

3.1 Formal Definition of the Task

We are given a set of texts from myriad sources, all relating to the same news stories. Let \( \mathbf{c}_1 \) and \( \mathbf{c}_2 \) denote the output of kCCA used in Fortuna et al. as shown in Figure 1. From this we can also derive
two vectors that denote the unique perspective of each viewpoint, as depicted in Figure 1 above. Let those vectors be denoted as \( \vec{v}_1 = \vec{c}_1 - \vec{c}_2 \), \( \vec{v}_2 = \vec{c}_2 - \vec{c}_1 \).

Given these definitions, the task is to assign each source \( s_i \) to one of 2 (or \( n \)) viewpoints, such that after applying kCCA the correlation is maximized between the source’s assigned viewpoint \( A(s_i) \in \{1,2\} \) and its associated viewpoint vector \( v_{A(s_i)} \). Alternative formulations will be explored, such as including in the objective function clustering-oriented criteria such as minimizing the maximum distance between a source and its viewpoint. With \( m \) sources and 2 viewpoints, there are \( 2^m \) possible assignments. Part of the research challenge is to find a tractable solution or heuristic approximation.

### 3.2 Example, and Use Case

Assume the content below, arriving from different sources:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Jerusalem</td>
<td>Nveh Yaakov</td>
<td>Sovereignty</td>
<td>Municipal</td>
<td>Green Line</td>
</tr>
<tr>
<td></td>
<td>East</td>
<td>Sanitation</td>
<td>Re-unified</td>
<td>Services</td>
<td>Jerusalem</td>
</tr>
<tr>
<td></td>
<td>Trump</td>
<td>Services</td>
<td>Eternal</td>
<td>Armistice</td>
<td>Rights</td>
</tr>
<tr>
<td></td>
<td>Green</td>
<td>Armistice</td>
<td>Freedom of</td>
<td>Municipal</td>
<td>UN</td>
</tr>
<tr>
<td></td>
<td>Rights</td>
<td>Municipal</td>
<td>religion</td>
<td>Different</td>
<td>Rights</td>
</tr>
<tr>
<td></td>
<td>Jerusalem</td>
<td>Sovereignty</td>
<td>Christians</td>
<td>Jerusalem</td>
<td>etc</td>
</tr>
</tbody>
</table>

Figure 2. Example input to extended algorithm

The algorithm’s output is:

- General words for this topic: Jerusalem, Trump, Municipal, Palestinians
- Viewpoint 1: Rights, Green, East, UN
- Viewpoint 2: Sovereignty, Eternal
- Assignment to viewpoint 1: Sources, A, E; Assignment to viewpoint 2: B, C, D

The new part is the assignment of sources to viewpoints. From this, we can derive the distance of each source from the center of each viewpoint. Figure 3 shows this for the example data.

<table>
<thead>
<tr>
<th>Source</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Distance from Viewpoint 1</td>
<td>.2</td>
<td>.5</td>
<td>.7</td>
<td>.9</td>
<td>.2</td>
</tr>
<tr>
<td>Distance from Viewpoint 2</td>
<td>.8</td>
<td>.4</td>
<td>.1</td>
<td>.2</td>
<td>.5</td>
</tr>
</tbody>
</table>

Figure 2. Output #2 from extended algorithm

Then we can position the various sources along this single dimension, as shown in Figure 3.

![Output #2 from extended algorithm, plotted along an axis](image)

Figure 3. Output #2 from extended algorithm, plotted along an axis
A user who reads from source E could be offered content from A, which is a more extreme version of E’s position; or content from C as a moderate but opposing viewpoint. With more than 2 viewpoints, the sources could be positioned on a map using multi-dimensional analysis.

For testing the algorithm, we intend to adopt one or more of the available datasets of known Republican (R) and Democratic (D) bloggers. Each set will be topic-modelled, and then we will manually or automatically match the Republican blog posts on a given topic with the Democratic posts on that topic. The union of both sets is given as input to the algorithm, and because each blog post is labelled as R or D, the researchers can measure the accuracy of the algorithm’s attempt to assign each blog post to one camp or the other.

4 Summary

News and other topical content can be presented from various points of view. This is a kind of bias, not in the sense of deviation from truth, but only in the relative sense that the content reflects a certain position on the subject. We conceive of this bias as a position along a single axis for each subject, e.g. for one subject the axis may represent liberal vs conservative, for another subject it could represent pro-Israel vs. pro-Palestinian, etc. We are working on a purely text-based approach to discover this axis while labelling individual posts/content by unknown authors, according to the position they occupy along the discovered axis.

Reference


Gottopati, S., Qiu, M., Sim, Y., Jiang, J., and Smith, N. 2013. Learning topics and positions from debatapedia. ACL.


1 Introduction

The Maman Group is the leading provider of logistics services in Israel, offers comprehensive services to government bodies and the foremost companies in the market. Maman's cargo operations, based at the cargo terminals located at Ben Gurion International Airport, provide a full range of cargo handling services for all international air cargo imported or exported from Israel. Although since 2008 Maman terminal has competitors, it handles cargo capacity up to 300,000 tons per year, which is about 56% from all cargo entered to Israel in 2017. Research focused on Cargo releases, where the work process is conducted between three central entities: customer, customer service, and release department. The process begins with the arrival of the customer to the customer service centre with a batch form and a release form (Get Pass). Then, after approval of the forms by customer-service and scanning barcodes the customer receives operation permission to enter with the truck to one of the ramps (the decision which ramp is done by the customer service clerk according to the type of cargo to be released). When the truck reaches the release ramp the customer comes to the release officer who receives the form and sends the forklift operators to pick up the cargo. When the batch and all cargoes have been collected, the release officer checks the cargo, scans the bar codes of the cargo and the forklift operators move the cargo to the appropriate truck.

2 Objectives

This is a normal text paragraph; the style for it is "Basic text". The main goal of this paper was to show application of process mining in a new field, cargo release process and to propose applicable framework to logistics processes. Specifically, we would like to discover and validate the actual process model of Maman's cargo release and to check if the company stands in declared service standard of 90 minutes to customers from typed bill of lading to end of release. If not, we would like to suggest methods that will help Maman achieve its declared goal. Cabanillas et at. (2014) explain that logistics processes have some characteristics which are fundamentally challenging from a business process management perspective. However, current business process management systems do not address these requirements which call for the integration of techniques from event processing. We would employ process mining approach, that as per Van der Aalst (2004) can reveal actual process, show conformance and possible quality issues that the company can improve. The framework can be adopted regardless of information systems in use and relay on actual data and statistics.
3 Research methods

Process mining (Van der Aalst, 2007) is a relatively new discipline built on model-driven approaches and data mining. It aims at providing methods, techniques and tools for the construction of models aligned with the reality, considering system execution traces (i.e., logs). Although some process mining techniques have been proposed and few tools are available, their usage still requires expertise in formal modelling and analysis. Therefore, they cannot be considered as straightforward solutions.

Three types of Process Mining methods were employed:

1. Discovery – This technique takes an event log and produces a process model without using any a-priori information.
2. Conformance - The existing process model described in interviews was compared to the event log of the same process. Conformance checking was used to check if reality, as recorded in the log, conforms to the model.
3. Enhancement - It was done to create added value to Maman’s Group by changing or extending the a-priori model, demonstrating process’s improvements.

4 Results

Log data of all activities in 2017 contained over 360k records, therefore adjustments were need to create picture of release process. This process left out activities that affect performance indicators but are irrelevant to research (as handling corps, all kinds of hazards, food etc.). Log file after filtering holds 72% of original log cases. Translation of data was performed in Disco Software to process map, there we could identify and analyse main movements of material in release process based on over 205,000 records, with frequencies. This accomplished the first goal – discovery of actual process as per real data log.

Conformance checking compered the release cargo process as described to actual process as found in process mining. It revealed new facts, such as re-work and attributes affecting it. For the third goal, enhancement, we focused on the cases that took up to 9 hours, as other cases were defined as exceptions. This enables us perform statistics on over 120,000 events that are 45% cases of original log file.

5 Discussion

Analytics was done on data log file creating valuable information to Maman group. This analytics was able to create a map with the actual release process showing all "paths" of process, defined as variants of the process. We found 4594 variants of original process, 8 variants of the process hold 67% of the cases. Analysing the frequent variants 4 problematic locations were identified, were cargo handling release process takes more than 90 minutes by median time and mean time. To each of the 23 locations in the warehouse we found release handling time, furthermore we produced statistics to each agent and carrier. This analysis includes all handling process, including rework (shifting cargo to wrong locations), idle time and bottlenecks. Conformance checking compered the release cargo process as described to actual process as found in process mining. As it is based on actual movements of cargo it revealed new facts, such as re-work and attributes affecting it.
6 Conclusions

Many conclusions came out from this research, we will emphasize only four of them. The first is that a major gap found between actual process to described process, especially focusing in time analysis. We found that 64% of the customers receive their cargo after 4.5 hours. It clearly showed that the company do not stand in its own service level and resulted detailed plan to change Maman's storage procedures. Our observations show estimation of release time cut by half.

Second recommendation is related to location – we recommend on shifting 3 remote storage areas (such as Pharmaceuticals) to new areas closer to loading area. As we could analyse those distances and the impact on release time we can show the expected improve release time to each location.

Third conclusion is that we found re-work in many releases, for example 1,654 times shipment moved from crane area to crane area. This cause a delay in release time, and of course waists resources and funds. Examination of re-work was done with management. Forth conclusion is related to quality. This analysis showed the company exceptions in quality as forbidden movements that were done that can cause quality issues (for example putting pharmaceutics cargo in export platform causes cooling issues that can damage the cargo). This issue were pointed to management in order to improve procedures to capture those gaps.

The main goal of this paper was to show application of process mining in a new field, cargo release process. We propose applicable framework that reveals actual process, shows conformance and possible quality issues that the company can improve. The framework can be adopted regardless of information systems in use, it relays on actual data and statistics, and produces easy to underhand maps of actual process with all variants.

References


