The Foundations of a Trustworthy Web

Full text available at: http://dx.doi.org/10.1561/1800000020

The Foundations of a Trustworthy Web

Piotr Cofta

piotr.cofta@cofta.net

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Boston – Delft

Foundations and Trends® in Web Science

Published, sold and distributed by:
now Publishers Inc.
PO Box 1024
Hanover, MA 02339
USA
Tel. +1-781-985-4510
www.nowpublishers.com
sales@nowpublishers.com

Outside North America:
now Publishers Inc.
PO Box 179
2600 AD Delft
The Netherlands
Tel. +31-6-51115274

The preferred citation for this publication is P. Cofta, The Foundations of a Trustworthy Web, Foundation and Trends® in Web Science, vol 3, nos 3–4, pp 137–385, 2011

ISBN: 978-1-60198-662-7

Foundations and Trends® in Web Science
Volume 3 Issues 3–4, 2011

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Foundations and Trends® in Web Science, 2011, Volume 3, 4 issues. ISSN paper version 1555-077X. ISSN online version 1555-0788. Also available as a combined paper and online subscription.

Preface

This monograph should probably be called 'The programmer's guide to socially compatible Web design'. It is a good example of what happens when the engineering mind of an author is applied to social systems theories in the context of world-wide ICT systems, i.e., to the modern world. It shows how those supposedly disparate areas can come together to form a single, coherent and useful model.

This monograph is also a 'prequel' to another monograph [33] that tries to address a deceptively simple challenge: how to make a web trustworthy. It is supposedly a worthy goal: as we all depend on the Web in dealing with many aspects of our lives, it would be extremely beneficial if we could trust the Web. However, in order to discuss the Web and society, we need a model. Here is where this monograph comes in. Here the challenges start.

There is a wide gap between so-called 'technical' and 'social' sciences. There is a popular belief that technologists generally despise people while social scientists are hopeless when it comes to technology. There is a lack of understanding and a lack of appreciation between those two groups. This is not surprising, as the structure of these disciplines is drastically different: technologists prefer layers while sociologists prefer circles. Technology tends to stick to hard facts; social science tends to work with changeable opinions. They are worlds apart. Or so it seems.

ICT (and the Web in particular) disrupted this cosy separation. If there is a single consequence of the Web, it is that the Web made technical systems susceptible to a socially inspired approach, and made society an indispensable environment of those systems. The co-development of society and technology has accelerated, but a shared understanding is still lagging behind. The Web became the largest and the least understood disruptor.

As there is yet no common vocabulary, one has to take sides. I followed what came naturally: by developing a technical, operational model of society in order to see how the Web disrupts it. One could have

taken another side and talked about the Web in terms of models taken directly from social sciences. Both are beneficial, but the approach taken here has an additional advantage as it lends itself to technical recommendations of how the Web could be improved. And that is a tangible outcome.

Foundations and Trends® in
Web Science
Vol. 3, Nos. 3–4 (2011) 137–385

DOI: 10.1561/1800000020

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piotr.cofta@cofta.net

Abstract

It is trivial to say that the Web has changed the lives of the majority of us. There is no activity that has not been touched by the Web (directly or indirectly) and — in this process — somehow altered by it. The Web (and other large ICT mega-systems) permeates our lives regardless of our awareness of it and whether we like it or not. We increasingly depend on it, and thus we would like to be able to trust it. Further, we would like it to be trustworthy — and these two constructs do not always go hand in hand. There is a separate monograph [33] that discusses trust and trustworthiness. This one provides a foundation for this discussion — a model.

In order to systematically discuss the Web we have to have a model of it. However, a technical model does not suffice, as the Web is not only a technical but also a social phenomenon, embodied in technology. As the ultimate goal is to discuss trustworthiness of the Web, it would be beneficial to model the Web from the social perspective and to position the Web as a component of social practices — the component that interferes with them. This requires a model of society as well as an analysis of how the Web affects this model. This monograph does just that: it takes a particular model of society, extends it in a way that is

relevant to the Web and defines the Web by systematically observing potential (and actual) changes.

This monograph goes one step further by asking the question what the Web look should like to be more relevant to its social function — if there is one. Again, the objective of this discussion is to facilitate a trustworthy web, as it is much easier to agree what a trustworthy web should look like if we know what the Web is for. The answer to this question leads to some practical design guidelines discussed here, whether they are technical, managerial or related to the governance of the Web. It is not a blueprint for a 'better' Web, but it is a discussion of the Web that may be more relevant to society — and hopefully more trustworthy in satisfying that society's needs.

Contents

1

Introduction

The Web and other large information and communication technology (ICT) structures are unquestionable parts of our everyday reality. While the Web is probably the best known one, there are other, somehow more autonomous mega-structures that include military networks, telecommunication networks, financial infrastructures, large governmental systems, as well as the growing range of 'smart' systems in areas such as power distribution and public transport.

It is therefore somehow trivial to say that ICT (specifically the Web) changed our everyday practices (at least for those of us who enjoy access to the Web), and that it changed it in a different way than the introduction of — say — trains or electricity. There is no intellectual activity that has not been touched by the introduction of the Web and ICT and — in this process — somehow altered by it. One can experience this impact several times a day. It would be beneficial to trust the web and to have a web that is trustworthy. A trustworthy web is discussed elsewhere [33]. This monograph provides a much needed model that facilitates that discussion.

When one asks a question what the Web is from a social perspective, it is probably not surprising that the answer will vary greatly,

depending on localised experiences and interests. Everybody may agree that the Web facilitates changes and thrives on them, but there is not a single answer to the questions of what the Web is in a social sense, and how to look at the Web in order to understand the breadth and depth of its impact.

It is easy to grasp what the Web is (and what its structure is) in a purely technical (and physical) domain. From this vantage point the Web seems to be just a large collection of hardware and software, stringed together by fibre optics, copper and radio waves, consuming a large amount of electricity. The Web is a technical artefact, as much as a car, a hammer or a printed and bounded book.

This is of course a very limited and a very technical view. This view does not explain what the Web is for society, in the same way as a description of a technical structure of a car does not explain the revolution that it brought about. In fact, any technology that allows for an incomparable flexibility of individual movement would have caused similar changes, and as society we are more likely to be interested in those changes (and rightfully so) than in the technology of an internal combustion engine.

Therefore from a social perspective, the Web is defined not by the ingenuity of its technology, but by the extent and diversity of its impact on social practices — on what it has done to the collective 'us'. The Web is effectively a man-made distortion that alters social practices.

It is interesting to systematically investigate the footprints of the changes that the Web did (and will do) to society, to reiterate how our social lives have changed, and how they may further be changed as a result of the proliferation of the Web. The challenge is in doing this in a truly systematic way. Not as a spot analysis of a single phenomenon, not as a limited area ethnography, but as a global analysis of a global change. This requires a model of society as well as an analysis of how the Web affects this model. This is what this monograph is about.

However, the Web has not been given to us once and forever. The Web is not like a rock, a diamond or water. It is a structure that can be (and continually is) changed through social practices. It can be designed, constructed and deployed. It is malleable, and can be adjusted to social needs. Therefore it is not only worth asking the question of

what the Web is (from a social perspective), but also what the Web may become (again from a social perspective) — what is the function that it is supposed to perform.

The answer to the latter question leads to some practical design guidelines discussed later on in this monograph. The Web is a socio-technical design, therefore design guidelines can be technical, managerial or may relate to a governance of the Web. Those guidelines do not form a complete blueprint for a 'better' Web, but they frame a discussion about the Web that may be more responsive to social needs.

This monograph assumes that we (collectively) are an invariant of this change. This means that our catalogue of social practices did not change and will not change because of the Web. That we still love and hate, befriend and betray, make statements and make enemies. The fact that we do it more often on the Web then we used to do before does not make a difference to the fact that we do it, only to how we do it. Treasured likeness of a loved one evokes the same feelings, whether it is a digital file, faded-out Polaroid or a miniature painting. There is of course a limitation: should we change beyond recognition, this analysis may no longer be relevant.

Eventually the Web will become an integral part of every social practice, as the new generation accepts it as a part of their natural environment. This is already happening, and it is happening very rapidly. Once done, the Web will be no longer a disruptor. The ripples that it caused will eventually settle. We may simply wait and see, but we may also anticipate and facilitate. This monograph should assist in the later approach.

1.1 Definitions

This monograph makes a distinction between an Information and Communication Technology (ICT) infrastructure, the Internet, the Web, the Semantic Web and Web 2.0. While casual definitions of those terms are usually intuitively well understood, it may be beneficial to clarify them here.

- An ICT infrastructure is a large-scale deployment of information and communication technology (ICT), together with its

immediate social environment of processes and operations. Thus, e.g., a mobile network is an ICT infrastructure that encompasses radio towers, back-haul links, mobile phones as well as customer support, politics regarding frequency allocation and engineers who run fraud detection processes. Other ICT infrastructures may include travel booking systems, or corporate payroll systems. The main focus of this monograph is on ICT infrastructures that exist on a national or global scale.

- The Internet is a particular implementation of a public global packet-switching data network, together with its social environment. Therefore the Internet is a global ICT infrastructure. It contains elements such as technical structures (cables, routers, modems), protocols and standards (TCP/IP etc.), supporting services (e.g., DNS), governance (e.g., ICANN) etc. There may be other global networks that are not public yet still share similar technology, but this monograph is only interested in this particular one.
- The Web is the Internet with the information overlay on the top of it, again together with its social environment. There are alternative definitions of the Web that stress its difference from the Internet. The traditional, technology-driven, fault line is demarcated by the HTTP/HTML protocol, but the proliferation of protocols 'above' the Internet may make this differentiation misleading. For all practical purposes, a 'pure' web deals with information (with certain meanings assigned to it) while a 'pure' Internet deals with data (possibly structured, but with no meanings assigned to it). Throughout this monograph, however, the term 'Web' will be applied to an ICT infrastructure that comprises the 'pure' Internet and the 'pure' Web together, unless stated otherwise.
- The Semantic Web [42] is an attempt to standardise and automate the layer of the Web that deals with the semantics of its content, and more generally with the sense-making. The approach of the Semantic Web is through the application of formal logic, on the basis of a variety of meta-tags

associated with the content. The Semantic Web developed its own communication stack that partially overlaps (and is partially builds upon) the stack that defines technology of the Web and the Internet.

- Web 2.0 is an under-specified construct, originally believed to be introduced by Tim O'Reilly (http://en.wikipedia.org/wiki/Web_2.0). Initially it simply described those sites that used any dynamic web page technology such as PHP or scripting. Currently this term is generally used to describe a variety of web-oriented socially embedded activities and technologies that support them, such as user participation, collaborative content creation, virtual communities, content sharing, reputation and recommendation systems etc.

1.2 Propositions

The motivation for this monograph originates from an interest in trust and trustworthiness enabled by an appropriate design of ICT infrastructures, and in particular the design of a trustworthy web. As trust is a social construct, one cannot properly study trust without first understanding how society operates and how the Web affects this operations. For that reason one can view this monograph as a 'prequel' (borrowing these word from the newspeak of mass media) to the monograph that discusses a trusted and trustworthy web [33].

It may be that we never achieve a trustworthy web, mostly because we may never agree on what the term 'trustworthy' really means. It is however possible to design the Web in such a way that makes it 'better', more responsive to social needs, and — in this specific sense — more trustworthy. Every design requires an ability to analyse the situation at hand, and this particular desire to design a 'better' web is no different — whether it applies to trustworthiness or to satisfying our collective social needs. As the Web permeates our modern social life, this essentially requires the systematic analysis of the Web from a social perspective, but through the eyes of a technologist.

It is useful to look at the Web as a distortion that impacts the operation and the structure of society and consequently the creation of

our social reality. Such a perspective reveals, in a structured way, what the Web truly is, and enables a thorough analysis of this situation — a precondition for designing a more socially relevant web, should this ever be desired.

Therefore this monograph proposes and discusses the following:

(1) An analysis of the consequences of the Web (as well as of its future) should be focused on the shape of an impact it makes on structures of social reality, not on any particular technologies.
(2) There is a joint model of society and the Web that allows for a systematic analysis of the impact of the Web on society.
(3) The Web changes (distorts) the way society operates, even though it changes neither the way humans operate nor the forms of the operation of society.
(4) The Web serves a particular social function that goes beyond being a mere conduit for a wide range of social communications.
(5) The Web can be made more responsive to its social role without resorting to any particular ethical judgements while certain design guidelines can be established.

1.3 Structure

This monograph has a structure that is supposed to guide the reader through propositions, thus reading it from start to finish is always the preferred way. However, there is no harm in reading this monograph in a more random manner, as it is littered with cross-references that should guide the reader to all the relevant sections.

As mentioned before, this monograph describes the model that was used by another monograph [33]. However, it is not a 'companion' to the other monograph, but rather an independent work on its own rights. It is not necessary to read the other monograph in order to benefit from this one — and it is not required to read this monograph to benefit from the other one.

There are three clearly defined parts of this monograph. The first part introduces a joint model of society and the Web. It includes this

introduction, Section 2 deals with the methodology and Section 3 deals with the operational model of social reality. It provides an extended introduction to social system theory in a way that is conducive to the analysis of technical constructs of the Web. Finally, Section 4 provides a discussion about the general view assumed by this monograph regarding the dynamics of the relationship between society and technology.

From there, the construction of a specific model starts. The first section of this part extends the model while discussing the impact of ICT has on society (Section 5), as found throughout literature. What follows is a detailed analysis of alterations of various components of the model of society caused by the existence of the Web. The discussion follows the structure of the model, i.e., it is split into three main parts: organisations, function systems and interactions (Sections 6, 7 and 8, respectively). The approach taken here is first to discuss ICT in general terms and then to focus on the Web. This discussion is followed by a section that specifically focuses on identity (Section 9). Finally, for a more formal approach, inspired by object-oriented programming, the reader can also have a look at the next section (Section 10).

The third part deals with design implications of the analysis shown in the previous part. It starts with discussing the limitations of our ability to impact on the design of the Web, then focusing on determining what the Web is for — i.e., what is the function of the Web (Section 11). From there, it reviews various problems that the current web faces, discussing them from the perspective of the assumed function of the Web (Section 12). The final section of this part (Section 13) discusses how far we are from such a 'better' Web — and whether we will get there at all.

Conclusions (Section 14) close this monograph, reviewing original propositions and demonstrating how they were addressed in the text.

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