Assessing Degrees of Web-2.0-ness for Websites:
Model and Results for Product Websites in the Pharmaceutical Industry

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Abstract

This paper describes the development of a maturity model to assess the Web-2.0-ness of websites. The model draws on O'Reilly's Web 2.0 principles and patterns. It distinguishes six dimensions with four degrees of 2.0-ness each. The rating scheme has been evaluated and refined to improve inter-rater reliability in a discussion and a coding iteration. This model raises awareness for 2.0-ness, helps to benchmark website design, and supports decisions about 2.0-ness adoption. Based on aggregated scores and a normal distribution, our sample of 44 pharmaceutical over-the-counter (OTC) product websites is classified in three maturity stages: Innovators, Adopters, and Laggards. The model can also be used for other industries and website types. In five of the six dimensions, at least one website reaches the top degree, but n one achieves top grades in every dimension. Diversity in 2.0-ness is observed for product websites in the pharmaceutical industry, as well as for one company's different product brands. Further research will extend the 2.0-ness analysis to the overall web presence, including social media sites. Another next step is to relate 2.0-patterns to websites' success measures.

Keywords: Web 2.0, 2.0-ness, maturity model, pharmaceutical industry, product websites, design patterns

1 Introduction

Web 2.0 design principles and patterns are a commonly known concept since the initial definition by O'Reilly (O'Reilly, 2007). Web-2.0-concepts are in an innovation adoption process, and themselves further evolving, e.g. regarding mobile Web 2.0. This is a typical situation for applying maturity assessment models (chapter 3). Assessing e.g. websites' maturity stages can raise awareness for the Web 2.0 design principles,

allows to benchmark website designs within an industry, and can lay the ground for decision aids about 2.0-ness adoption. As 2.0-concepts revolve around participation, these decisions belong to the communication strategies for business partners, e.g. in the customer relationship. Maturity models then become management instruments.

While 2.0-ness assessments exist (e.g. Chiang 2009; Görlitz et al. 2010; selection of models in (Back 2010)), there still is a need to develop a maturity model like approach that meets several requirements: A maturity model has to

- be based on widely accepted constructs for Web-2.0 principles and theories of design patterns,
- be tailed enough to yield differentiating assessment results, and
- give insights into steps for advancement, and
- be applicable with low cost and minimal training in practice.

We therefore set out to develop such a theory-based model, and apply it to a well selected sample of product websites in a specified industry as proof of concept.

We draw on O'Reilly's (2007) principles and patterns, select and reinterpret them for our model's application context, in order to define the dimensions of the maturity model. This model allows measuring the degree of a website's Web-2.0-ness – in the terminology of maturity models, the 2.0-*maturity levels* or 2.0-*maturity stages*. Applying a maturity assessment to consumer-facing product websites of the pharmaceutical industry is an especially interesting object of analysis for several reasons. Firstly, the 2.0-concept stands for a change in communication behavior, both of the company and the consumer. Secondly, this industry's marketing budgets allow for innovative website development, while on the other hand this industry has its natural reservations when it comes to 2.0-practices such as user input and user centric design (cf. Alkhateeb et al. (2008) for a legal view on Web 2.0 marketing in the USA). We therefore expected to find a spread from early adopters to laggards in 2.0-adoption. After presentation of the results, we conclude the paper with limitations of the study and follow-up work.

2 Theoretical Foundations

2.1 Maturity Models

Maturity models are used in many application areas. E.g. there are specific maturity models for E-learning (Marshall, 2007), IT-business relationship (Hirschheim, Schwarz & Todd, 2006), and the classical CMMI (Capability Maturity Model Integration) for software engineering. Certain *components* are common to all maturity models. Every model knows maturity levels - others call them *stages* (van der Sleen, unknown date) or level of capability (Jokela et al., 2006). They define the level in which the process, company, or whatever is analyzed, is situated in. The result of a maturity assessment is the – usually nominal – overall value for the output variable *maturity stage*. For example, the SEI (Software Engineering Institute) CMM lists the five values: Initial, Repeatable, Defined, Managed, and Optimizing (Gillies & Howard, 2003, p. 780). Underlying this top measure, there are so called *dimensions* or foci of assessment (Jokela et al., 2006, p. 264). These dimensions are mostly graded with three to five different *degrees*; you may talk of capability levels also for these dimensions. A third differentiator for maturity assessment models is how the data – basically the input into the model – is meant to be collected. Mettler (2010, p. 338) identify three different

methods: Self-assessment, third party assisted assessment, and outsourced to certified practitioners.

2.2 Design Patterns and Web 2.0 Principles

In software design, the term "design pattern" stands for technical aspects from a designer and programmer perspective (WIKLET, 2010). Authors like Governor et al. (2000) and the scientific pattern-community work on formalization and validation of design patterns and respective reference models. The abstraction levels for the concept of design patterns vary widely (Winter et al., 2009). For our purpose the perspective of the user, the overall "customer experience" with the website, is core, as it determines user interaction and popularity of a website. Therefore our understanding of the concept adheres to the more abstract description of Cooper (2000, p. 5) who write „*Design patterns focus more on reuse of recurring architectural design themes*, […]" and a design pattern "[…] *addresses a recurring design problem that arises in specific design situations and presents a solution to it*".

In this light, O'Reilly's formulation of Web 2.0 design principles and patterns in 2005 (published as O'Reilly (2007), later revised in Musser (2007)), though not perfect, is rooted in the design pattern theory. He extracted the principles from identifying the common design solutions in web-based business models that stood out through surviving in the dot-com bubble-burst era. Although there are diverse other definitions and approaches to Web 2.0 (Kim et al., 2009; Raman, 2009), his one is the original and is widely cited. He outlined seven principles of Web 2.0 which are: *The web as a platform* (aka *innovation in assembly), harness collective intelligence* (aka *architecture of participation), data is the next "Intel Inside", end of software cycle* (aka *perpetual beta), lightweight programming models, software above the level of a single device*, and *rich user experience*. In Musser (2007), *leveraging the long tail* was added.

While they are meant to describe the common characteristics of successful, innovative web-based business models, they can also be transferred for analyzing the elements of customer facing corporate websites.

3 Web-20-ness Maturity Model

In the following section, we describe how we interpret the 2.0 principles and design patterns as a theoretical basis for our model and how they translate into our six dimensions of Web-2.0-ness. For our analysis it is important to concentrate on those principles that relate to the design of websites for product brands. Thus we cut out the three O'Reilly principles *leveraging the long tail, lightweight programming models*, and *end of software cycle* from further consideration, as these relate specifically to web-bases business models.

3.1 Dimensions

3.1.1 Participation

Participation is drawn from *harness collective intelligence (aka architecture of participation)*. This principle is the most important one. It represents the mainstream understanding of Web 2.0. Participation is what decisively distinguishes Web 2.0 from Web 1.0 (Kim et al., 2009, p. 662). This also fits the commonly accepted description as

a Web of 'user generated content' (UGC). This is a sharp contrast to the past, where corporate web presences have seen themselves as content providers.

Participation comes in different intensities. A well known concept to subdivide participation behavior into levels is the *Social Technographics Ladder* (Li, 2008, supplemented by Forrester in 2010 by the step *Conversationalists* to represent microblogging). We use the distinction between the ladder's steps *collect*, *critic* and *create* in defining this dimension's degrees.

3.1.2 Platform Integration - Mashup

This dimension corresponds to *web as a platform (aka innovation in assembly).* Mashups combine data from different sources into new content elements (Hoyer, 2009). Data can come from inside the organization or from external parties. The grading rules in table 1 show that we accept even widget-like elements as a weak form of mashup.

3.1.3 Platform Integration - Device

The second *Platform* dimension corresponds to *software above the level of a single device.* Most services today are made with web-technologies (Raman, 2009, p. 56), and the mobile web extends to the mobile devices. The Browser, being the "universal lens for the Web" (p. 52), is now present in all sorts of devices. This has to be leveraged. Services can harness even more data from their users, e.g. GPS information from smartphones or pad-computers. All these potentials are described by Tim O'Reilly & Battelle (2009) as the so called "*Web Squared*", the next step in the evolution of Web 2.0.

3.1.4 Knowledge

Providing Knowledge is one of the key aspects of some Web 2.0 business models and websites. This has its roots already in the Web 1.0 knowledge sharing concept. Providing Knowledge and information was one of the fundamental ideas when the web was created. The dimension Knowledge is closely connected to the principle *data is the next Intel inside*. O'Reilly wrote (2007) that having data today is a unique selling proposition, as was with Intel chips ("Intel Inside") for computers (p. 5). In our interpretation, a website's content provides added value when information beyond the core product is provided. Added value is created in a collaborative or collective process when websites become open, allow collaboration, or aggregate user generated content in a way that yields collective intelligence. Surowiecki (2004) coined the term *wisdom of the crowds* for the concept that aggregated amateur knowledge can excel experts' one.

3.1.5 Rich User Interface - Usability

The dimension Rich User Interface (RUI) equals O'Reilly's wording, but here we do not view it from the technical background of the websites like O'Reilly (2007) or Kim et al. (2009). It has to be seen from the perspective of the *experience* that the underlying technologies create for the users of a website. This experience has become *richer* the further the web has been developed. Mainly it came about with the introduction of *AJAX* that updates a website without reloading. Information is exchanged between the browser and the server unnoticed in order to make websites interactive. All modern websites use *JavaScript*, and users demand this as a must-have (Kim et al. 2009, p. 664). A website might not be 2.0-like when it just uses *AJAX*, but it definitely is not Web 2.0 if it's not using this fundamental technology of today's Web. Here we expand the notion of RUI to the concept of *Usability*, covering aspects of overall ease of use.

3.1.6 Rich User Interface - Multimedia

Another facet of user experience is the multimedia-infusion of a website. Although not often mentioned, this is very important in our opinion. Therefore we added this dimension as the content aspect of RUI. Podcasts, online clips, and photo sharing are part of everybody's online life today, and the vast majority has the connotation of multimedia content with the Web 2.0 concept. The growth and share of images and video in consumers' web-searches and uploads shows that the trend towards "Visuality" (Kelly, 2008) is real and deserves a separate category to depict its different aspects.

3.2 Rating Scheme for Degrees of 2.0-ness

Table 1 with the final rating scheme depicts how the values 0 through 3 for the degree of 2.0-ness in each dimension can be attributed.

Grade	P: Participation	PM: Platform Integration: Mashups	PD: Platform Integration: Devices
0	Contact form only (Web 1.0)	No mashup-like integration of content	Single device (e.g. PC/Notebook)
1	Facebook Like; and/or one or two user activity types, such as 'recommend page via e-mail-form', e-cards, interactive tests, online games, competitions to win a prize	Widget-like elements even if from company's own content base (incl. blog as part of the product website) (e.g. Gesundheitsnavigator and Pollenvorhersage)	One option only: Website optimized for mobile devices, or smartphone app in one app store
2	Three or more of grade 1 interactions or several options of social bookmarking, like, tell-a-friend (similar to Forrester's *Collect*)	Machup with company external web-content (e.g. Google Maps or allergie.com glossary)	Combination of one app store plus optimized website. Special case: SMS-interaction (e.g. in nicorette)
3	Comments (text), upload of own fotos to e-cards e.g., forums, blog or community as part of the site (similar to Forrester's *Critic/Create*)	Mashup with a diversity of company external webcontent services	Apps for more than one app store (whether optimized website or not)

Grade	K: Knowledge	RU: Rich User Interface: Usability	RM: Rich User Interface: Multimedia
0	Hardly any valuable information beyond core product information (only via links to other websites)	Design mostly text-oriented and textual hyperlinks	Mostly text-oriented content
1	Diversity and richness of information beyond the product perceivable as *added value* (servicing and teaching the customer; a reason to revisit).	Uses current technologies, has a functional design. But look-and-feel is not 2.0-style (see grade 2 description)	Uses topic relevant fotos, animated pictures/graphs plus perhaps a singular Video, especially the products TV-spot
2	Collaboratively user generated content or knowledge, openly visible, in 1.0-format, such as discussion forum	Like 1, but look-and-feel is clearly 2.0-style (among other characteristics: minimalistic, simple navigation, header-banner, blog-design-like, visual, similar to e.g. styles of youtube, ning, mixxt.)	Three or more of these: fotoslideshows, animated pictures/graphs, ringtones, audio podcast, singular video/s (esp. TV-spot)
3	Community-like and collaboratively user generated	Allows personalization (personalization), e.g. including	Several elements (on top of an at least RM-grade 1 website):

content or knowledge, openly visible, in 2.0-format, such as blog and idea contests with user interaction such as voting and commenting)	or excluding widgets or customizing other design elements. Often Login required (e.g. interactive migraine diary)	video-podcast beyond TV-spots (e.g. expert interviews or customer statements); video tutorials (CommonCraft-like or similar to web-based trainings), Interactive games, paint apps.

Table 1: Rating Scheme for Grading the Dimensions

Linked websites got included as part of the main product website if the domain of the linked site had the product name in it; for Usability we deducted one point if programming problems or errors made a pattern not functioning.

The coding scheme is the result of a rigorous procedure for designing and then validating it. To raise objectivity, we developed it in mutual discussions, evaluated and validated it in two rating iterations (chapter 4.2)

3.3 Maturity Stages

The adoption of Web 2.0 can be seen as an innovation process. Thus we design and name the stages based on the Diffusion of Innovation theory which builds five categories of innovativeness: Innovators, early adopters, early majority, late majority, and laggards (Rogers (2003)). Our model distinguishes only the three maturity stages "Innovators" (innovators and early adopters), "Adopters" (early and late majority), and "Laggards" into which the analyzed websites will be classified; while maturity models of long established and complex fields like software engineering, with the CMMI, use more than three stages, we decided to restrict our model to fewer stages, as the overall field is still young and dynamic, and as this distinction fully serves our model's purpose and intended managerial audience. The attribution of stages results from the aggregated assessments of the six dimensions, and taking a normal distribution as a basis. We expected to roughly have one third of the assessed websites fall into the Innovator and Laggard categories - the left and right edges of the normal distribution - and two thirds to fall into the Adopter category.

4   Results for Pharmaceutical Consumer Product Websites

4.1 Sampling

As sample we chose German websites of pharmaceutical companies. This will not constrain us to German companies, as German websites of international companies such as GlaxoSmithKline will be analyzed as well. As Web 2.0 is mostly used in communicating to the customer, the sample will be narrowed down to publicly accessible websites for marketing purposes. We excluded e-recruiting sites that also serve marketing purposes, as they normally operate globally and therefore are not German sites. Many companies' online marketing strategy also includes presence on social network sites (SNS) such as twitter. We decided to started our research by limiting it to the investigation of traditional product websites. Hence, any web presence or marketing effort of a company for a product in a SNS-site (like a group on Facebook) will not be reflected in this analysis.

The next step of narrowing down the targeted websites has a regulatory background. The German legislation strictly defines what is allowed and what is not when it comes

to marketing in the pharmaceutical industry. According to Article 10 Heilmittel-werbegesetz (HWG), it is not allowed to market products which are only available on prescription. Thus only websites of non-prescription products, called over-the-counter (OTC) products will be analyzed.

In total we examined websites of 44 OTC products produced by nine pharmaceutical companies; not all of them sell the same set of products. The majority of products fall in three categories[1]: Eight painkillers, mostly against headache or migraine; ten dietary supplement products, and ten for heartburn or stomach ache. The rest are more or less different, such as ointments (e.g. for wound healing or athletes' feet) and various kinds of patches (e.g. for blisters or against snoring or for nicotine dehabituation).

4.2 Rating Scheme Design and Validation

The first version of the rating scheme was developed in intense discussion by the authors (= raters), both being experienced social media users. To achieve a good common understanding, the scheme was then tested in a face-to-face session using two selected websites, one (*bad-duerrheimer.de*) with assumed low 2.0-ness, one (*hohesC.de*) with assumed higher grades, to achieve a good common understanding. The resulting refined version of the scheme was used for the rating of the 44 websites, where the raters worked independently. Inter-rater reliability was then calculated for each dimension, as deviations in ratings of both coders occurred. Few deviations were either due to errors (e.g. a rater overlooked design elements of a website in the dimensions Participation and RUI-Multimedia, or took a mismatching grade from the rating scheme (3-5 times each of us)). These errors got corrected. Remaining differences could be eliminated through clarifications with minor refinements of the scheme, as well as with greater modifications, that built the basis for the final rating iteration round. After these rounds, the raters reached consensus.

The evaluation and consecutive redesign to the final rating scheme was guided by the calculation of an inter-rater reliability (IRR) coefficient, Cohen's (1960) Kappa, for the outcome of the first rating round, including our errors. For the six dimensions, this IRR for 2 raters and 44 subjects amounted to: Device 0.7608696; Mashup 0.6597938; Participation 0.4909091 (*higher after error correction*); Knowledge 0.3962873; RUI-Multimedia 0.2119403 (higher after error correction); RUI-Usability 0.03479576. Interpretation of Kappa values, after Landis (1977), is poor strength of agreement for values <0.2, fair for 0.21-0.40, moderate for 0.41-0.60, good for 0.61-0.80, and very good for 0.81-1.00. The low value for Knowledge led to a re-definition of the grades, making the distinction between grades 1, 2 and 3 much clearer. The values for Participation, RUI-Multimedia and especially RUI-Usability could be tackled by good clarification that made finding consensus in follow-up discussion between the two raters easy.

4.3 Results for Pharma Comsumer Product Websites

Table 2 depicts an overview of the grading results: The number of occurrences of each grade in every dimension showing quite different "grade fingerprints". In all but one of the six dimensions, at least one website reaches the top degree. On the one hand,

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[1] Our categorization might not be fully correct in a medical way, as we are not medical experts

especially the Platform Integration dimensions are being neglected by most companies. Only very few products support their web content with either a mashup on their website, or a special mobile app for the growing smartphone market. On the other hand, especially Web 2.0 aspects of dimensions that already play an important role in Web-1.0 design, such as usability and multimedia content, can be observed more often. The knowledge dimension reserved grades 2 and 3 for community & collective knowledge, which led to few occurrences, while almost every site provides added value through knowledge beyond the mere product information.

<div align="center">Dimension</div>

Grade	Participation	P-Mashup	P-Device
0	‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖ 19	‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖ 33	‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖ 40
1	‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖ 17	‖‖‖‖‖‖‖‖‖‖ 7	‖‖‖ 2
2	‖‖‖‖‖ 5	‖‖‖‖‖ 4	‖ 1
3	‖‖‖ 3	0	‖ 1

Grade	Knowledge	RUI-Usability	RUI-Multimedia
0	‖‖‖‖‖ 5	‖‖‖‖‖‖‖‖‖‖ 7	‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖ 11
1	‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖ 37	‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖ 16	‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖ 17
2	‖ 1	‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖ 19	‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖‖ 13
3	‖ 1	‖‖‖ 2	‖‖‖ 3

Table 2: Distribution of websites' maturity degrees in each dimension (44 product websites)

Table 3 shows the individual assessments for all websites, their so-called *maturity profile*. These profiles show that never a website achieves top grades in every dimension. The high variation in the grades of the dimensions is also mirrored in the dimensions' average grades.

A good example for a website with low Web-2.0-ness (*Laggards*) is microklist.de. This website just presents some information about the product (resulting into Knowledge grade 0). It also doesn't activate the user (Participation 0), and does not show a Web-2.0-like look-and-feel. These shortcomings typically display how a websites still sticks to Web 1.0 only, and hasn't implemented Web-2.0 design patterns at all.

An example for the maturity stage *Adopters* is formigran.de. An element like a self-test such as a migraine test, is a typical interactive content object that websites use to activate a user in an easy and playful way. It leads to grade 1 in Participation. Formigran.de is also typical when it comes to multimedia content. There are some multimedia files to support the textual information, but overall very few. This is commonplace for the websites in the Adopter category, they mostly provide company-generated content and have still room for more multimedia and for opening up, like *Innovators* demonstrate.

In the maturity stage of *Innovators*, the top graded example (13 out of 18 possible) is alliprogramm.de. In our sample, it excels in the use o Web2.0 principles. The site uses many diverse multimedia elements to support the text content. It includes a forum to enable user interaction in order to add value for future users, and it even provides a special iPhone and Andriod app. A missing element in this website is (from a Web-2.0-ness standpoint) that it doesn't use other website services to create mashups.

4.4 Induction of Maturity Stages

The overall Web 2.0-ness of a website is the result of the aggregated 2.0-ness degrees in each dimension. In the terminology of maturity models, certain numeric intervals or combinations of degree-sets can be defined as *maturity stages*. We defined three stages for the overall website 2.0-maturity. In order to classify these websites into stages we used the normal distribution of SUM (see table 3) as a guideline. Our expectation (paragraph 3.3) to be able to classify roughly one third of the assessed websites into the Innovator (~11 %) and Laggard (~18%) categories, and two thirds into the Adopter (~70%) category could be fulfilled by the data quite well.

Website	Company	P	PM	PD	K	RU	RM	SUM	Stage
alliprogramm.de	GSK	3	0	3	2	3	2	**13**	Innovator
nicorette.de	J&J	3	0	2	1	3	3	**12**	Innovator
aspirin.de	BAY	2	2	0	1	2	3	**10**	Innovator
frubiase.de	BOE	3	1	0	3	2	1	**10**	Innovator
bepanthen.de	BAY	1	2	0	1	2	3	**9**	Innovator
aktren.de	BAY	0	2	0	1	2	2	**7**	Adopter
talcid.de	BAY	1	1	0	1	2	2	**7**	Adopter
thomapyrin.de	BOE	2	0	1	1	1	2	**7**	Adopter
buscogast.de	BOE	2	0	0	1	2	2	**7**	Adopter
Abtei.de	GSK	2	0	0	1	2	2	**7**	Adopter
mucosolvan.de	BOE	1	0	0	1	2	2	**6**	Adopter
allergieratgeber.de[1]	J&J	1	1	1	1	1	1	**6**	Adopter
dolormin.de	J&J	1	0	0	1	2	2	**6**	Adopter
voltaren.de	NOV	1	0	0	1	2	2	**6**	Adopter
grippostat.de	STA	1	0	0	1	2	2	**6**	Adopter
lefax.de	BAY	0	1	0	1	1	2	**5**	Adopter
Priorin.de	BAY	0	1	0	1	1	2	**5**	Adopter
Rennie.de	BAY	0	1	0	1	1	2	**5**	Adopter
dulcolax.de	BOE	1	0	0	1	2	1	**5**	Adopter
formigran.de	GSK	1	0	0	1	2	1	**5**	Adopter
femibion.de	MER	2	0	0	1	2	0	**5**	Adopter
calcium-sandoz.de[2]	NOV	1	0	0	1	2	1	**5**	Adopter
canesten.de	BAY	0	1	0	1	1	1	**4**	Adopter
antistax.de	BOE	0	0	0	1	2	1	**4**	Adopter
terzolin.de	J&J	0	2	0	1	1	0	**4**	Adopter
imodium.de	J&J	1	0	0	1	1	1	**4**	Adopter
nasivin.de	MER	1	0	0	1	1	1	**4**	Adopter
fenistil.de	NOV	0	0	0	1	2	1	**4**	Adopter
sodbrennen-kontrolle.de[3]	NYC	1	0	0	1	1	1	**4**	Adopter
sanostol.de	NYC	0	0	0	1	2	1	**4**	Adopter
caltrate.de	PFI	1	0	0	1	1	1	**4**	Adopter
spalt-online.de	PFI	0	0	0	1	2	1	**4**	Adopter
zovirax.de	GSK	1	0	0	1	1	0	**3**	Adopter
thermacare.de	PFI	1	0	0	1	1	0	**3**	Adopter
centrum-online.de	PFI	0	0	0	1	1	1	**3**	Adopter
compeed.de	PFI	1	0	0	0	1	1	**3**	Adopter
buscopan.de	BOE	0	0	0	1	0	1	**2**	Laggard
niquitin.de	GSK	0	0	0	1	1	0	**2**	Laggard
cetebe.de	GSK	0	0	0	1	0	0	**1**	Laggard
Kohle-compretten.de	MER	0	0	0	1	0	0	**1**	Laggard
aleve.de	BAY	0	0	0	0	0	0	**0**	Laggard
effortil.de	BOE	0	0	0	0	0	0	**0**	Laggard
besseratmen-nasenstrips.de	GSK	0	0	0	0	0	0	**0**	Laggard
microklist.de	J&J	0	0	0	0	0	0	**0**	Laggard
Average		0,8	0,3	0,2	1,0	1,4	1,2	4,81	

Table 3: Results for dimensions of the analyzed websites (date of assessment: May 1st, 2011);

P = Participation, PM = Platform Integration – Mashups, PD = Platform Integration - Device, K = Knowledge, RU = Rich User Experience – Usability, RM = Rich User Experience-Multimedia, SUM= Sum of P+PM+PD+K+RU+RM.
BAY = Bayer, BOE = Boehringer Ingelheim, GSK = GlaxoSmithKline, J&J = Johnson&Johnson, MER = Merck KGaA, NOV = Novartis, NYC = Nycomed, PFI = Pfizer, STA=Stada,
[1]allergieratgeber.de is the website of the product "Livocab";

[2]Sandoz is a subsidiary of Novartis,
[3]sodbrennen-kontrolle.de is the website of the product "Pantocol"

4.4.1 Laggards

Eight websites or 18.18% were classified as Laggards, as the sum of their grades is 2 or less. Falling into the Laggard stage denotes very scarce use of Web-2.0 principles. Websites in this group obtained less than 12% of possible grades.

4.4.2 Adopters

Adopters depict a group of websites which have started adopting Web-2.0 principles but have not yet fully committed to the concept. 31 websites (or 70.45%) with maturity sum of grades between 3 and 7 were classified in this stage. They mostly understand the principles of Web-2.0 and start using them, but still have some work to do in order to close ranks with the Innovators. Thus a website could be classified in this group by obtaining a 1 in just half of the dimensions.

4.4.3 Innovators

This stage represents the highest Web 2.0-ness stage in our model. Websites reaching this stage have shown strong understanding of Web 2.0 and have gone far in implementing the principles. They fully embrace the ideas, will probably try to stay updated, and could be pioneering in the next evolution phases of the Internet as well. In total five websites (or 11.36%) were classified as Innovators. The sum of their grades is 9 and above. A website needed at least three times a 2-grade in order to be classified in this group. The highest of all had 13 as the sum of all grades.

5 Discussion and Conclusion

The analysis of the OTC pharmaceutical product websites reveals that this industry is conservative regarding integration of Web-2.0 design patterns into their product websites. Especially the *Platform Integration* patterns *Device* and *Mashup* are neglected. Still, a handful of flagship websites implement the ideas of Web 2.0, proving that some market players are moving. Web-20 design patterns already important to the companies are to provide a rich user experience; this includes patterns in the *Usability* and *Multimedia* dimensions. Also notable is that all but five websites achieved at least a 1 in knowledge, and that only one website was graded 2 and another one 3 (for knowledge creation in forums or a blog). Industry clearly views knowledge beyond the pure product information as a value added service to their customers, but to enable users to create knowledge seems not to be regarded as very desirable. A reason for this might be regulatory risks. To a certain extent, we considered the regulatory background through choosing OTC products; but also they have some regulatory hurdles. Because the websites are about drugs, there might be seen a problem with too much user involvement and input when it comes to the use of these drugs. Pharmaceutical companies are very aware of the restrictions to not create legal problems or even liability cases.

There are other limitations and questions which are not addressed by the presented maturity model. First of all we did our analysis without communicating with a company. Thus, the analysis did not take into account the intentions of the marketing department of the companies. Some probably deliberately do not want their product's website to be very Web-2.0. Perhaps their target customers do not appreciate 2.0-ness,

e.g. senior citizens who are target group of growing importance for the pharmaceutical industry.

Also, we limited our observations to the traditional product website and excluded social media channels (such as a facebook group or a youtube channel). There are several online communities (incl. social media channels), apart from these websites, where user participation and knowledge creation are taking place; these 2.0-like ventures might substitute for according efforts on the product websites.

Even with acknowledgement of these limitations, our analysis clearly shows that analyzing websites with a maturity model for Web-2.0-ness yields interesting results. The model proves to be practicable in contrast to many very intricate maturity assessment methods which are turned down by practitioners for being too complex to understand and train, and too costly to apply. To validate our rating scheme in a more rigorous fashion, the model can easily be applied by raters who have not been involved in the model's development, e.g. other researchers in this field or practitioners such as product managers. The maturity model we present may be used – and adapted – for the assessment of other types of websites. E.g. e-recruiting web presences can be analyzed and compared within specific industries. Even workplace intranets may be an object of 2.0-ness assessment.

At this very early stage of 2.0-ness-adoption in the pharmaceutical industry, we consider the granularity of our model and results as just right for managerial practice to fulfill the currently relevant thrusts; the model can raise awareness, and alleviate the prevalent high insecurity and confusion about the 2.0-concepts

Extending the 2.0-ness analysis to the overall web-presence of a product, including social media channels, is the next research step. Also, as the overall extranet design matures, we expect more differentiated assessment models of Web 2.0 principles to be needed that define 2.0-ness in terms of more granular *design patterns* (cf. Governor, 2009). Additionally, as we targeted the German market only, the situation in other markets with their own restrictions (especially outside the European Union) would be interesting to take into account when putting together samples for 2.0-ness assessments and for cross-case analyses. An example for regulatory problems when adapting Web 2.0 into the marketing mix of a drug is the warning the FDA issued because of a Facebook widget from Norvartis (Mack, 2010) (for additional legal problems cf. Alkhateeb et al., (2008)). Furthermore, a follow-up research challenge is how to measure the impact on ROI and on the business goals that the product or marketing managers define.

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