EVOLVING KNOWLEDGE: EMPOWERING INFORMATION USERS

(Practice-oriented Paper)

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Abstract: The quality of semi-structured and unstructured information on Intranets is becoming increasingly important to the efficiency and competitiveness of organizations mainly employing knowledge workers. However, the greatest problem with the quality of information on Intranets is not that the initial process for insuring this quality is defective – usually, the quality of information is initially high. Rather, the main problem is the de-facto "decay" of previously high-quality information due to a lack of timely updates and changes to reflect the changing world around us. In this context, framing the problem of information quality in analogy to the *production* of an information product fails to address the problem. Rather, we must think about this challenge from the perspective of providing a *service* keeping up with ever-changing requirements. Here, total control (at the expense of speed) may actually be much less desirable than explicitly allowing "quick and dirty" changes that work *most* of the time.

Key Words: Information Quality, Knowledge Management, Content Management, Evolution, Open Content, Open Source

"When a subject becomes totally obsolete, we make it a required course."
– Peter F. Drucker

INTRODUCTION

Most organizations have long used structured information – databases, spreadsheets, etc. – for managing and controlling their daily business. Data is collected on markets, suppliers, internal processes, customers, etc.

However, for organizations mostly employing knowledge workers (such as professional services firms, universities, technology companies, research units, etc.) *un*structured or *semi*-structured information is becoming increasingly important as their organizations' Intranets make the shift from a mere one-way *publication* medium to an interactive *communications* medium for capturing, aggregating, sharing and developing critical information and ultimately exchanging knowledge.[1]

Why is this unstructured information becoming more important? Because the environments in which organizations operate are so complex and changing so fast that it becomes increasingly difficult to map relevant information in a highly structured model. The advantages of a clear, structured model in a stable

[1] Information requires a real-life *context* to yield knowledge. I.e. one of the basic heuristics of the *IBM Cynefin Centre for Organisational Complexity* is that "We only know what we know when we need to know it". Thus, the request "Write down what you know on subject A" is meaningless – and will yield meaningless results – unless the intended audience and the context of the request are understood.[14]

environment can quickly turn into a *disadvantage* in a rapidly changing environment due to issues of inflexibility. [6]

OVERCOMING ENGRAINED PARADIGMS

Today's problems come from yesterday's solutions.
– Peter Senge

It has often been stated that an army is always fully prepared to fight the *last* war – but not the *next* one. We also know from psychological research that humans are likely to stubbornly keep using an approach that has worked before, well beyond its reasonable lifetime. That is, we keep applying outdated approaches and tools to new problems, even if a much simpler and more efficient way of solving the new problem has become available in the meantime.

We suggest that something similar happens with how Intranets are regarded and used in many organizations today. They are used mostly for electronically facilitating processes that worked well for us *yesterday*, without much consideration about whether the *new tools* would also support totally different – and perhaps superior – *new work processes* today. Let us examine some ancient paradigms that have survived into the 21st century Intranet, like the concept of a library.

Over the last decade, we have been able to observe a steep rise and fall of the term "knowledge management" (KM). The present author is more convinced than ever that proper knowledge management is the key to success in today's and tomorrow's marketplace. However, it is no surprise that the hype bubble surrounding KM" had to burst: It was widely being regarded, framed and attacked using the library paradigm of "storing and retrieving information".

And while no-one would seriously suggest that the concept of a paper library (let's take the library of Alexandria, for example) is a great new way to do "Knowledge Management" in the 21st century, somehow the same concept – supported by a computer database instead of ink and paper – somehow convinced many that efficient storage, search and retrieval systems are indeed the key to managing knowledge.

The Library paradigm and finding quality information in time

There are no answers, only cross references.
– Weiner's Law of Libraries

Not being able to find what you are looking for is a classic problem. It is also one that can often be traced back to the library paradigm: In a library, every book can physically only be in one place. So a book on "Information Quality" is either located under "Information" or under "Quality". To get around this problem, libraries have catalogues that allow multidimensional indexation: even though the physical book can only be in one place, its placeholder card can be in several categories.

The big puzzle is: With the *World Wide Web* showing us daily the superiority of cross-linking information directly by hyperlinks – why have many *Intra*nets not caught on? Too many Intranets are still structured to represent the organizational hierarchy, rather than the networks formed between related topics of knowledge. Imagine what would happen if the whole *World Wide Web* could only be navigated

top-down from some root homepage – and every time you wanted to move from subject *A* to (related) subject *B*, you would be forced to navigate 3 hierarchies up along subject *A* and then drill down 4 hierarchies to subject *B*. It would be a complete disaster.[2]

Many organizations have realized by now that a pre-determined, hierarchical structure will not suffice to categorize and navigate all their knowledge – because it is not flexible enough. Salvation is being sought in full-text-indexing of all content on the Intranet by a central search engine – but search engines by themselves will not solve the problem, due to their lack of semantic comprehension. It is interesting to note that perhaps the most popular search engine on the Internet actually use *human judgment* for identifying the most relevant links, not just text mining. It does so by analyzing the hyperlink structure[3] between web-sites. It uses many imperfect and poorly structured pieces of information to aggregate recommendations regarding information quality by many *informal* reviewers – without the need for any centralized, *formal* reviewer who would become a bottleneck. [2]

This technology is based precisely on a lack of formal structure, a lack of formal review process, instead basing its success on the ability of *everyone* on the Internet to just put up a web-page with information and start linking back and forth with other pages. By now, there are even several technologies that allow this kind of "Peer-to-Peer" approach (considered by some to be bordering on anarchy) in publishing and evolving time-critical information in an organization's Intranet.[9] [7]

Practitioner problems today

So while the *technology* to overcome problems associated with the traditional paradigms is available, many organizations as still struggling because the simplistic "*knowledge management = information storage and retrieval*"[4] equation has left an old paradigm in the minds of the decision makers. And the results are not pretty, as this extract from interviews done with practitioners in a client project to improve the internal flow of information and knowledge may serve to illustrate:

- "There is just too much stuff there"
- "It's all sorted by department – but when you need information, you need it search by problem or topic – and you can't do that properly"
- "It's all there somewhere, but you have to find the right server first…"
- "You never know if the information is up to date. Some project puts it there and then it just rots…"
- "It doesn't get updated. You find info that's 3 years out of date"
- "No-one is really in charge of keeping this stuff up to date – and that shows."
- "It's just not intuitive to use."
- "You need time and good luck to find what you are looking for"
- "It's somewhere in the database. Good luck."
- "Lost in Cyberspace…"
- "When the first time you submit something interesting to the designated moderator/reviewer for

[2] Those who have been on the Internet in the pre-web days before 1991 will recall the relative difficulties in finding and navigating information with the services available at the time, mainly Usenet News and FTP, with tools like Gopher and Veronica… The HTTP/HTML standards allowing simple hyper-linking and navigation became an overnight success.

[3] Effectively, hyperlinks referring from site A to site B represent the result of a micro-decision by the webmaster or site A to refer to site B for some relevant information. These human decisions are leveraged by Google to provide search-results of much higher quality than mere text-mining engines, which are quality-agnostic.

[4] For a very different view on what constitutes knowledge, please refer to Dave Snowden's papers.[13][14]

internal publication – and it just disappears with no comment – you learn never to waste time with that again."

- "It's too much bother to submit information to be published. So I just keep it on my PC…"
- "If you know exactly which database you need access to, you will get that access eventually. But you don't know which database you need access to in the first place, because you can't see what's inside it without access… A 'Catch 22'."

So despite the many technological, organizational and conceptual advances in the area of Knowledge Management,[11][13] many organizations still base their Intranets on old paradigms that have been around for literally hundreds of years: The traditional *Reviewer*, *Publisher* and *Library*. The key problem with these paradigms lies in being an obstacle to information flow – both in terms of *speed* (vital information is submitted, but not published in time) and as an extra *burden* that prevents knowledge being made available (vital information is documented in the organization, but not made available). The *Reviewer* > *Publisher* > *Library* paradigms were invented in an age when "time-to-publication" was mostly a non-issue. And even with today's technological means, the old processes and mind-sets slow down the publication of information to a crawl. I.e. the time between submission and publication date in international journals can often lie in the 12-18 month range.

This is the reason why in several fast-moving scientific areas, the traditional *Reviewer* > *Publisher* > *Library* paradigm has been supplemented (and occasionally even *supplanted* for all practical purposes) by the use of "Preprint-Servers", where papers are made publicly available by their authors even before the review process starts – out of the simple necessity to make results publicly available before they are rendered hopelessly obsolete – which they *will* be by the time they have run through the formal review process.[5]

As this practical example illustrates, viewing Information Quality from a static perspective with a focus on initial perfection is not enough. The impact of *time to availability* can be a significant factor in information quality – especially under a "fitness for use" definition.[16]

CONTROL AND PERFECTION

The concept of an "information product" has been around for some time, representing the engineering perspective of information quality (i.e. information is explicitly "manufactured" and the outcome of a production process, rather than simply a by-product of a main organizational process). The advantage of this approach is the explicit focus on what happens up to the point where quality information is published, i.e. in a database. While this is a solid approach for structured information (data) that is relatively stable or has known and fixed update cycles, the main quality problems for *un*structured information (such as FAQs, HowTos, lessons-learned, best practices…) on an Intranet tend to arise *after* the initial publication. For this problem, the focus on the quality of information as a *product* is not helpful. We must take a step further and view the information from the perspective of providing a service that must conform to different – and rapidly changing – customer requirements.

It is clear to see that any piece of information that *had* arbitrarily high quality at the time of its publication (by whichever standard) will be useless – or even potentially harmful – if, due to changes in the environment it is supposed to represent, it is *outdated*, *irrelevant*, *late* (i.e. not published yet, because it is still in a quality-assurance process) or *unavailable* (i.e. not published at all because the author was discouraged by having to go through the quality-assurance process in order to have it published).

[5] A prominent example is the Cern Document Server (CDS) at http://cds.cern.ch/ hosting over half a million papers that otherwise would not – or *not yet* – be available to practitioners.

Information Quality research – due to the nature of the subject "quality" – has a natural tendency towards the "absolute" and the "perfect". But we need to realize that "quick-and-dirty" information that is available *now* may be much more valuable than near-perfect information… that comes too late.

FROM PRODUCT TO SERVICE

"Nobody buys ¼ inch drill bits – people buy the benefit of being able to create ¼ inch holes."
– Service marketing mantra

We must become better at quickly making available, understanding and managing *incomplete, ambiguous* and *potentially flawed* information if we wish to keep our information up to speed in an increasingly real-time environment by viewing information as a *service* rendered, rather than a *product* to be acquired. *Nobody needs information – people need better decisions.*

It is very clear that information – especially that found in corporate Intranets, which is supposed to support employees in their daily work – is a *service* and a perishable good: The practitioner in need of the information has a definitive, often very small window of time and attention during which information can help to improve a decision. After that short window of opportunity, the value of the information for that practitioner quickly drops to zero, like any other perishable good.

Fortunately, this service analogy is finding its way into information quality models. I.e. Kahn, Strong and Wang [3] integrated the service aspect with introduction of the *Product and Service Performance* matrix (PSP/IQ model):

"Information also can be conceptualised as a service. A service is a deed performed by one party/machine for another; it is experienced, used, or consumed; it is perishable, for you cannot keep it […]"

THE CASE FOR EVOLUTION: SPEED

"If everything seems under control, you are not moving fast enough"
– Mario Andretti

The aforementioned problems all stem from one common cause: Typically, neither the content, nor the structure of information on Intranets is allowed to evolve. It is not sufficient to put one person or group in charge of the Intranet or a part of it. These moderators/webmasters/gatekeepers are typically not the ones who need to work with the information as producers or consumers on a daily basis. Knowledge Management should *not* be a department… or if it is, it should only be responsible for the *environment* and not for the *content*.

We need to realize that control and perfection regarding information quality are *illusions* that can only be entertained in a static, *timeless* environment. As soon as we enter a dynamic, changing environment, we run the risk of managing information quality to obsolete standards – of making sure that a piece of information we would have needed to improve a decision *yesterday*, which has become pointless *today* – will be available to the whole organization in a controlled and perfect fashion *tomorrow*.

Recognition of this problem has popped up in several areas. One example is military decision-makers

looking to wall-street futures traders in order to learn about the skills to make decisions under extreme time-pressure, given a barrage of highly volatile, imperfect and ambiguous information, as opposed to basing founded, rational decisions, given well-structured, quality-assured information… that are too late to matter.[18]

The power of imperfect –but evolvable– systems

Named after Prof. Clay Shirky, a *Shirky System* is "*A system where having good participants produces better results than having good planners*". [12]

The World Wide Web is a wonderful example of the success of Shirky systems: It is based on loose and open standards that would *never* have emerged under centralized, rigorous planning. There were much "better", more "logical" and "complete" markup languages available at the time for structuring content.[6] And this is precisely why it was so successful: HTML was simple to work with and easy to adapt.

> *Centrally designed protocols start out strong and improve logarithmically. Evolvable protocols start out weak and improve exponentially. It's dinosaurs vs. mammals, and the mammals win every time. The Web is not the perfect hypertext protocol, just the best one that's also currently practical. Infrastructure built on evolvable protocols will always be partially incomplete, partially wrong and ultimately better designed than its competition.*
> – Clay Shirky

The same phenomenon exists with regard to information quality: Centrally *designed* and *reviewed* information starts out strong… and then often deteriorates to the point of uselessness through *aging*. Evolvable information starts out weak but can improve exponentially and adapt quickly and continuously to changing demands.

A case in point is the joint Nupedia/Wikipedia effort to create a free online encyclopedia with a goal of over 100 000 entries. Run and managed by the same team of people, the project was initially started under the traditional Reviewer > Publisher > Library paradigm (Nupedia.com). However, the team realized that they had a problem when after more than one year, merely dozens of entries had been submitted, reviewed and published. The team then added a *collaborative layer* (Wikipedia.org) to their project and only two years after launching this collaborative twin, they are at 150 000 entries and counting. This success was based on eliminating the distinction between producers and consumers of information, and is an illustration of the incredible potential of applying the evolutionary paradigm to creating and managing information.[19]

The artificial distinction between producer and consumer of information

"Science is the belief in the ignorance of experts."
- Richard P. Feynman, Nobel Laureate, Physics [1]

The key to achieving information quality through utilizing the *speed* of such an evolutionary approach lies in first eliminating the distinction between producer/reviewer and consumer of information.

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[6] I.e. there was fierce debate in the early nineties about why established scientific publishing markup like L_AT^EX had been ignored in favor of the much more flaky HTML – especially since the Web grew out of the desire to navigate and link scientific papers. But HTML got the job done more quickly and was easier to learn than L_AT^EX. (Note that the present author argues this despite being a *passionate* fan of L_AT^EX for typesetting ;-)

It is an often-raised concern that by empowering regular employees to be not just a consumer, but also a producer of information, the quality of information would be diluted. In order to ensure high quality, only the experts, so the argument goes, should be allowed to create, review and update information. But quite on the contrary, it has been demonstrated numerous times that massive peer review and participation in reviewing and editing information can actually lead to higher information quality than traditional approaches based on the review of only a few designated experts. This has not only been shown in the area of open source development and documentation, but also regarding traditional journal publication (i.e. PublicLibraryOfScience.org [4]).

Indeed, there has been a recent case of large-scale scientific fraud, where a prominent researcher was able to publish 16 different papers in traditional, respected science journals, without the fraud ever being noticed during the 16 review processes. Only a tip-off by a peer brought the house of lies tumbling down.[15]

Turning Gatekeepers into Team Players

In many organizations today, the separation of producers and consumers of information into different, persistent *roles* (as opposed to different, transient *situations*) is feeling increasingly anachronistic. The same practitioner who *acts* as a consumer of information in one situation will act as a producer of information (i.e. he solved a problem or gained an insight) in the next situation.

In a complex word that is changing faster every day, the artificial distinction between producers and consumers leads to information quality problems.

- An error is not fixed right away because the person finding the error lacks access rights to change the information.
- An update or addendum is not applied because the person able to provide this information does not have sufficient privileges

We suggest that on Intranets, gatekeepers and gates for information create bottlenecks resulting in low perceived information quality from a service perspective. We believe that these gatekeeper roles – in the sense of Lewin [8] – are in many cases created *inadvertently* and *unintentionally* because the *tool* demands an administrator and/or moderator, and because that is the way we are used to working with information under the traditional paradigms – and *not* because there is a serious business rationale behind the role.

Gatekeepers should be re-trained and re-branded as release-managers for information. In this function, they would no-longer control access to the information, but build quality-checked releases based on information already available to all. This introduces a transparency that eliminates the traditional – and well-researched – problems of having a gatekeeper function impair the workflow.

We propose introducing two layers of information: the collaborative layer and the managed release layer – in analogy with the proven and very effective evolutionary approach of Open Source Projects.[10][17] The basic layer is the collaborative layer – every employee should have both read and write access to this information by default – without the need to “apply” for it. Changes are tracked in a logfile, so problematic changes can be revised – and the accountability for changes is an incentive for employees to provide high-quality input. This layer is the “petri dish” for the evolution and development of information.

On top of this layer exists the *managed release layer* – this is a “quality-controlled”, periodic release (i.e.

in cycles of 1 month or 3 months), which is managed by a moderator/release manager, who can draw on all the information available in the collaborative layer and picks, chooses pieces of that information in order to compile a complete release (i.e. an FAQ or HowTo on a certain subject), using his subject-matter expertise to quality-review and add value to the individual contributions.

The main difference in this model is that this role is no longer a gatekeeper in that it determines who gets access to what information. Everyone has instant access to the collaborative layer. So the gatekeeper is no-longer an obstacle, but actually adds value by providing an extra service on top of the collaborative layer. And if he is doing a bad job, it will be obvious to all participants (and can therefore be addressed), due to the system's transparency.

LESSONS LEARNED – AND STEPS FOR CHANGE

In one project we discovered that by rolling out a pilot collaborative environment in which all users could create, update and change information by themselves, eliminating the previous detour through an (administrative) gatekeeper, within two weeks over 100 new pages with information relevant to an ongoing project had been created and structured, without anyone explicitly being "ordered" to do so. About half of the pages were started with information that had previously been stored only on an individual's workstation (and thus not practically available to others who might have needed it). The other half was created "on the fly" when users realized the power of a shared information space, and started adding to each other's contribution to build a common base of useful information and hints.

But despite successes like this, the gap between the published body of knowledge about information quality – and what part of that body is actually implemented to affect real changes in real organizations – is disconcertingly large. Part of the problem is that many brilliant conceptual solutions rely on large-scale, step-changes in how an organization, its partners and its members work today. Unfortunately, such large-scale changes are very difficult and costly to implement in the daily, real-life environments characterized by severe time-, resource-, and budget pressure.

Therefore, we propose a portfolio of small steps that may be applied – either in concert or individually – to provide tangible relief in some main areas. We have also found that being able to demonstrate value through small but tangible changes will make it much easier to garner support for larger, more thorough changes later.

KISS - Keep it simple, stupid!

In Knowledge Management, there is a tendency to look for a solution in new and fancy tools – often at the total neglect of the traditions, habits and needs of the people who are expected to use them.

Information is a perishable good

Like Airline-Seats or vegetables, information must be thought of – and managed – as a perishable good. Determining quality after the useful life of a piece of information is an excersice in history. The idea of applying quality-control mechanisms that delay the "time to market" of a perishable good in a significant fraction of its shelf life is inherently flawed.

Give your information a history – it needs one

Information needs a history. Currently, often only one version of a piece of information is accessible at any one time. But providing easy access to the last few versions – and their changes – through an automatic change log can help eliminate many uncertainties. I.e. you get to see what the last "reality" was (Who was formerly in charge of this? What did the process *use* to look like? What was our former

perspective on this problem?), what the major changes were (so this is new – the rest of the document stayed the same), who changed what (I can ask A and B about this – they made the changes…), etc.

Don't micromanage uncertainty – delegate decisions to the information user
Levels of uncertainty need to be accepted. The world around us is full of risks and uncertainties. Pretending that we can somehow make sure every piece of information in an Intranet is "certified" to be accurate is an elaborate – and very costly – exercise in self-deception. Instead, we need to have different standards for different uses. The minimum accepted level of certainty for a given use of information should not be decided by the author or a reviewer, but rather by the *user* of a piece of information.

Put Practitioners in Charge
Put the practitioners in charge of the Intranet, not some designated "Knowledge Stewart", who is left with the impossible task of guessing, ahead of time, what information the practitioners will be needed when, where and in what form.

Provide a Shared Space, not a Publication
Change large parts of the Intranet from a publishing channel for the hierarchy to a participative "shared space" where everyone can fix errors, update information and add wisdom without prior review. The review happened when you hired that person, and with log files, you can slap their fingers if they do something really stupid. But don't waste everyone's time micromanaging your people's every move.

Tap into Self-organization
Support self-organization to complement the formal information flow processes: Provide a simple mechanism to start (and stop) mailing lists, FAQs, discussion forums, new Intranet pages, etc. – without anyone having to ask anyone else for permission, access, money or authority.

Publish first, review later.
Publish first, review second. Of course many kinds of information need to have some "stamp of approval" – you may take it to a customer, or a contract may be based on it, etc. In these cases, *still* publish first and review second. Have an "unofficial" version available that can evolve – and regular "releases" reviewed and managed by someone that carries the stamp of approval. This will give everyone an early warning what is shaping up, instead of being hit by unexpected things in an eventual "final" release.

Force Gatekeepers to become team players – or replace them.
To improve the quality of information on an Intranet, it is important to *remove and retrain the gatekeepers*. They are ostensibly there to safeguard the quality of information. But by being bottlenecks and inhibitors to the timely dissemination and evolution of perishable information, they are actually often doing more harm than good. Use them as managers for periodic releases – and if they don't play with the practitioner team, replace them.

Fix broken navigation, allow rampant hyperlinking
Streamline the navigation from the user's perspective, not the management's perspective. Keep it simple – and don't blindly trust designers and "interface experts". Go ahead and ask employees how they search for information. Seek out complaints. Look over their shoulders. Have one "official" navigational structure to the Intranet content – but give everyone the freedom to add hyperlinks and new pages, to reflect *their* view on the content.

Adapt measurements – eliminate broken measures
Make sure you know what you measure – you will get it! The best tools will fail if people have no incentive to use them in the way you want. For each measurement, consider if you need it at all. People

are very good at gaming explicit measures for knowledge sharing – they will conform to the form, but not the intention of the measurement.

Only evolution can keep pace with evolution.
Attempting to employ "rigorously reviewed" static information representations – with significant time periods between them – is a bad idea if you want to make sense of an evolving world. If information is not allowed to evolve, its quality can quickly degrade to the point of uselessness. Don't try to out-smart evolution with a top-down approach – remember Ogrel's rule *"Evolution is cleverer than you are"*[7]

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