Abstract: The modern-day executive is repeatedly told how Information Quality is essential to efficient business operations and seamless reporting. However, the proposed solutions are often technically-oriented and fail to find understanding and support in the organization. This article proposes a no-nonsense approach that bridges the gap between Business and Information Technology using a basic model and suggests some ways forward.

Key Words: Data Quality, Information Quality, Business Awareness, IQ Trend, Data Standards, Data Ownership

THE IMPORTANCE OF INFORMATION QUALITY (IQ)

For reasons of cost and business globalization, organizations are requesting their Information Technology (IT) systems to support increasingly integrated business operations. IT systems become more global, regrouping various business areas in the same functional environment to secure significant savings and additional customer value.

And guess what? Most organizations find this consolidation process painful, sometimes leading to the collapse of enterprise-wide IT projects, sometimes associated with major business disruptions [1, 2]. The classical culprits are the failure to re-engineer the legacy business processes and inadequate Information Quality.

Adequate Information Quality secures the following main elements:

• **Timely and accurate basis for decision-making.** Bad data (late, inaccurate, irrelevant, duplicated or incomplete) about customers, suppliers and products is likely to require significant rework to provide executives with a true, complete picture of the state of the affairs [3]. This implies manual treatment and manipulation of the information adding delays, high costs and risks.

• **Supply chain efficiency.** In a context where customers and suppliers are increasingly spread across the world, having accurate information is vital to ensure fluidity of supply chain operations. Wrong specifications are not likely to be identified before the faulty goods are delivered, leading to increased time to customer. Costly quality assurance is required to compensate for lack of Information Quality control.

• **IT business case realization.** In modern applications, such as ERP (Enterprise Resource Planning), CRM (Customer Relationship Management) and BI (Business Intelligence), business transactions and reporting rely on pre-defined master data that cannot be changed at execution
Faulty data may require complete roll-back and re-execution of transactions once the issue has been fixed. The probability is high that the costs of poor quality data will exceed the benefits expected from the implementation of such IT systems [1, 4].

- **Reduction of transaction costs.** Inadequate Information Quality requires expensive workarounds, often hidden in the daily operations. In the worst case, users do not trust information and spend a significant amount of time verifying the data or trying to locate the accurate records amidst a jungle of databases.

While data quality solutions are increasingly available to help solving these issues, no tool will ever substitute to practical business know-how. Data quality tools or not, the improvement of Information Quality relies on the successful leverage of the business knowledge, therefore proximity with the business operations is the key success factor. Imbedding IQ within the ordinary business processes is not only bringing lasting results, it is also the most cost-effective solution.

**A BUSINESS-LED APPROACH FOR SELF-SUSTAINING IQ**

Let’s assume that every customer sales representative checks and corrects the basic customer data every time an order is processed: the overall quality of the customer information base will improve with time. If the information users are trained to use the same data maintenance standards (i.e. using the same way to name the clients in the system, to type in the addresses, etc.), the likeliness of having a customer record duplicated or missing information declines.

Using the same logic, if every product owner is checking the accuracy of the product data at commercial release time, for instance ensuring that the naming, classification, production, logistical and controlling information follow the agreed enterprise standards, the probability for wrong or misleading information will be low, while back-and-forth communications across process steps are reduced.

Organizations should organize their processes in a way that, at every step of the business operations, Information Quality will slightly improve. Instead of fighting against natural IQ decay, the organization finds itself in a “negative entropy” zone where tending the data becomes a mere exercise of matching the information against its supporting standards. IQ is no longer a struggle, but becomes a self-sustaining process.

This basic model relies on business mobilization and compliance to standards which are discussed later in this article. It calls for a strong and smart business involvement as illustrated by the three following prerequisites.

**I. Business Awareness.**

If business people are convinced of the importance of Information Quality, they will put a serious effort in improving it. The same applies to the management: a won over executive is more likely to push for implementation of IQ improvement programs than an indifferent one. Business Awareness can be achieved through various means, like enterprise communication or set-up of IQ Key Performance Indicators (KPI) [5, 6] in employees Balanced Scorecard [7]. In the cases where IQ becomes an obvious cause for business disruptions, painful awareness rises from the entire organization.

**II. Information Ownership.**

This condition is the gold key to Information Quality. The universal rule of Information ownership states that “if nobody owns it, nobody will fix it”. Information ownership must be assigned to named business
people: they retain most of the information-related knowledge; they are the best suited to take the appropriate decisions and will get the nearly all direct benefits of IQ.

III. Information Quality Trend.
Setting absolute Information Quality targets often leads to expensive programs of one-time data cleansing that address short term requirements. Once these activities are completed, entropy kicks in again and information quality starts to decay [8]. Short-term fixes are effective if and only if they are associated with long-term sustainability programs. This is the way to secure lasting IQ improvements. Concentrating on the trend leads to long-term, sustainable and cost-effective solutions as opposed to a wasteful policy of successive short-term fixes. IQ KPI’s must show clear, measurable improvements (or maintenance of satisfying indicators) over time against pre-defined IQ standards. The primary focus is made on most business relevant information elements e.g. current customers, suppliers and products: there is no purpose fixing data on past one-time customers, low volume suppliers and obsolete products. This often enables fast returns in business - less time required to find out good data, forced closure of needlessly open transactions- and IT operations - reduction of needs for data storage and archiving.

These three pre-requisites are necessary to achieve permanent and cost-effective Information Quality improvements. Assessing the state of two of these - IQ awareness and the IQ trend - enables positioning an organization on the Information Quality Grid, which will determine what IQ roadmap would be the most effective.

THE INFORMATION QUALITY GRID

Information Quality Awareness (Horizontal Axis)

The IQ Awareness determines how well IQ is understood into the organization. Low ranking indicates that the impact of IQ is shared by few individuals or groups and is not likely to lead to enterprise-wide definition of standards or broad adoption of IQ improvement programs.

Asking the “asset” question allows a quick assessment of the IQ Awareness. When a majority of managers and professionals endorse the notion that data is a key asset - through education, internal best practices or experience of daily pain due to inadequate IQ- the organization is likely to be high IQ aware.

Awareness is somewhat subjective and cannot be directly measured. The following table should help the organization to situate itself along the IQ Awareness axis.

<table>
<thead>
<tr>
<th>Low IQ Awareness</th>
<th>High IQ Awareness</th>
</tr>
</thead>
<tbody>
<tr>
<td>“Blissfully Unaware”</td>
<td>“Frustrated Crowd”</td>
</tr>
<tr>
<td>No drive to IQ</td>
<td>Bottom-up drive to IQ</td>
</tr>
<tr>
<td>IQ degrades</td>
<td>IQ degrades</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Positive IQ Trend</th>
<th>Negative IQ Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>“The Drain”</td>
<td>“Self Sustaining”</td>
</tr>
<tr>
<td>Top-down drive to IQ</td>
<td>Enterprise drive to IQ</td>
</tr>
<tr>
<td>IQ improves at high cost</td>
<td>IQ improves at low cost</td>
</tr>
</tbody>
</table>

Figure 1. Positioning an organization into the Information Quality Grid according to two dimensions: IQ Awareness and IQ Trend.
<table>
<thead>
<tr>
<th><strong>Type</strong></th>
<th><strong>Criteria</strong></th>
<th><strong>Low IQ Awareness</strong></th>
<th><strong>High IQ Awareness</strong></th>
</tr>
</thead>
</table>
| Business | Understanding of the importance of good Information Quality to sustain business operations | • Understood by few individuals or groups  
• Most business people do not seem to be concerned by information quality  
• Data is perceived as useful to support the business transactions | • Data is defined as a key asset to support business operations and IQ is essential  
• Broadly understood within the organization  
• Data is understood as the main interface between business process steps |
| Business | Objective evidence to support an IQ improvement business case exists:  
• Costs of non-quality (or benefits of quality)  
• Costs of information repair  
• Costs of data maintenance | • Business does not grasp the notion of IQ benefits  
• None or few IQ repair costs are known  
• Cost of data maintenance is unknown | • Cost of non-quality is known or estimated  
• Business has at least a good idea of the investments necessary to improve IQ |
| Technical | Channel to solve Information Quality issues | • Issues are identified and solved mostly by IT  
• There is no formal process to support IQ issue-solving | • Issues are identified and solved by business with IT technical support  
• There are processes for solving IQ issues |
| Technical | Existence of standards:  
• Business and technical metadata definition  
• Enterprise codification standards and business rules | • Few data standards exist on a ad-hoc base, mainly technical oriented  
• Information about data standards is difficult to locate | • Key data are documented from a business and technical perspective  
• Documentation on data standards is centralized and globally available |

**Information Quality Trend (Vertical Axis)**

The Information Quality Trend defines whether the IQ increases with time (positive trend), decays (negative trend) or remains stable. A low positioning in the IQ Grid indicates that the organization has no effective control on its IQ. The absence of existing and objective measurements may be due to lack of standards and processes, making improvement of IQ doubtful. Being high on the scale indicates a fairly good amount of control - however the informed executive will want to know at what cost.

Asking the “IQ measurement” question allows a quick assessment of the IQ Trend. When an organization cannot assess the IQ Trend objectively or few (or none) IQ measurements are deployed there is a high likeliness that IQ Trend is in the low range.

The following table should help the organization to situate itself along the IQ Trend axis.
## Information Quality Trend (Vertical Axis)

<table>
<thead>
<tr>
<th>Type</th>
<th>Criteria</th>
<th>Negative IQ Trend</th>
<th>Positive IQ Trend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business Criteria</td>
<td>IQ enhancement initiatives:</td>
<td>• Short-term actions to fix immediate business issues</td>
<td>• Short-term, one-time actions to increase the speed of IQ improvement</td>
</tr>
<tr>
<td></td>
<td>• Data cleansing</td>
<td>• Based on ad-hoc standards</td>
<td>• Based on pre-defined, cross-area standards</td>
</tr>
<tr>
<td></td>
<td>• Standards establishment</td>
<td>• “Leaking tub”: as soon as completed, IQ degrades again (iterations needed)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Measurement of IQ:</td>
<td>• IQ Trend may or may not be assessed or estimated</td>
<td>• IQ Trend is measured with objective criteria</td>
</tr>
<tr>
<td></td>
<td>• IQ measurement types</td>
<td>• Sampling, based on perceived accuracy</td>
<td>• Advanced statistical measurements based on deviation from agreed standards</td>
</tr>
<tr>
<td></td>
<td>• IQ criteria used</td>
<td>• Using ad-hoc criteria</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• IQ trend calculation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Technical Criteria</td>
<td>IQ Technical KPI’s</td>
<td>• Information aging measurement (e.g. % of records not maintained for more than one year)</td>
<td>• Business relevance</td>
</tr>
<tr>
<td></td>
<td>• Technical means of measuring IQ</td>
<td>• Duplication sampled ratio</td>
<td>• Ratio of compliance to standards</td>
</tr>
<tr>
<td></td>
<td>• IQ technical definition criteria</td>
<td>• Data accuracy sampled ratio</td>
<td>• Consistency measurement</td>
</tr>
<tr>
<td></td>
<td>IQ supporting technology</td>
<td>• Many ad-hoc, departmental tools for data maintenance</td>
<td>• Enterprise tools and workflows for data maintenance are widely deployed</td>
</tr>
<tr>
<td></td>
<td>• For data maintenance</td>
<td>• None or few enterprise-wide data control solutions</td>
<td>• Shared data supported by enterprise solutions</td>
</tr>
<tr>
<td></td>
<td>• For control of shared enterprise information</td>
<td>• Ad-hoc IQ reporting of limited reach</td>
<td>• Standard IQ reporting</td>
</tr>
<tr>
<td></td>
<td>• For IQ reporting</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## Organization’s IQ According to Its Positioning on the Grid

### The “Blissfully Unaware”

Organizations suffering from the “Ostrich-syndrome of Information Quality” - denying the existence of IQ issues until the wake-up call of a sometimes harsh reality - are likely to be “Blissfully Unaware”. Constituents of this IQ Grid section often neglect the importance of their own data or are delegating the associated competence at departmental level. Lack of standards prevents adequate information management and control. Low awareness removes the drive for improvement. Information-driven business issues exist but are not associated with IQ. Ultimately, this position is not stable and without action, organizations will creep into adjoining squares, depending on the context:

- Increasing business disruptions caused by inadequate data quality generate awareness that IQ control is necessary. Should the management listen to and understand the complaints of the users, the organization can start to address the issues effectively. Otherwise, the organization will move into the “Frustrated Crowd” IQ Grid square.
- Externally acquired IQ awareness may lead the management to engage into IQ improvement activities without securing broad awareness. The de-coupling between management intent and business buy-in usually prevents the effective implementation of ill-perceived solutions. Significant IQ investments bring disappointing results. IQ can increase, but its sustainability requires a constant and expensive effort. The organization moves into “The Drain” section.
The “Frustrated Crowd”

An organization in pain due to inadequate Information Quality is a strong candidate to belong to the “Frustrated Crowd”. Users are generally conscious that lack of IQ disrupts business operations, requiring heavy workarounds or extra work to make the information useful. Initiatives may exist to solve the issues but they do not bring benefits as they are missing the adequate standards to support improvement targets. Quick fixes collide with each others, concurrent data maintenance and lack of ownership structure contribute to the overall entropy. Organizations in this area may evolve in two different ways:

- No structured action is taken and the situation worsens. The natural evolution in this section is an increase of suffering and potential loss of competitiveness that may eat up the resources required to get out of the vicious circle. Departmental or unit-level improvement initiatives may bring relief, but pain will emerge again at contact points. Frustration increases, putting the management under pressure.
- Management decides to address the issues through the implementation of Information Quality improvement programs. This approach leverages the general awareness and pain into an overall drive for success. Business will support the initiatives to eliminate its problems. Paradoxically, the issues are transformed into a critical success factor as it becomes a driver for better practices, as long as there is an overall co-ordination of the improvement program components. However, there is a high likelihood to rise toward the “Self Sustaining” section if the management is serious about the initiative and a well-designed improvement program is put in place.

The “Drain”

It is the realm of organizations that try to improve the Information Quality outside the business operations. IQ increases as a permanent, iterative effort is put into fixing the issues while the daily business continues to generate poor-quality data. It is equivalent to filling a leaking bucket: success is possible but it does imply waste. The root causes for this situation can be found amidst misplacement of information ownership (and associated accountability) and lack of information quality rules, metrics and guidelines. Organizations in this section may experience three evolution paths:

- Cancellation of disappointing IQ improvement projects. It could happen through conscious cost-cutting decisions, disappointment or progressive abandonment of the initiatives through lack of interest. In any case, IQ decays and the organization withdraw into the “Blissfully Unaware” section.
- Grit the teeth and carry on. It is a conscious effort to continue the fight for IQ improvements despite poor results, less-than-effective investments and some times disappointed users. The objective is to improve the IQ faster than it naturally degrades – however at a cost. It may work as long as the management supports the strategy and is ready to pay the price but is not a sustainable approach, as more resources and money will be “drained”
- Raise awareness level. Without user endorsement, there will be a permanent struggle between the IQ improvement efforts and the decay caused by the business neglect. Getting the business to support the IQ improvement drive by “plugging the leak” will increase the efficiency of the whole strategy, leading to a reduction of the IQ investment level. Such an organization will migrate toward the “Self Sustaining” square.

The “Self-Sustaining”

Any organization would wish to reap the benefits of self-sustainable Information Quality, where the IQ controls are integrated in the day-to-day operations. The target objectives are met with high business awareness and the IQ controls integrated in the day-to-day operations. At this point, the organization
experiences “negative entropy” where IQ tends naturally to improve without requiring significant costs. The key factors to consider for maintaining an organization in this area are focus and attention. Still, despite being a stable position, it requires some level of attention as the organization can still move out of this section, for instance:

- **External disrupting factors.** Mergers & Acquisitions, Business Process Reengineering, change of IT systems, strategic shift may bring significant alteration to the execution of the business processes. If the IQ standards and procedures are adapted to account for the new environment, the disrupting factors will not cause long-lasting impact. However, if the IQ matter becomes neglected, it will lose its effectiveness or in the worst case, its entire usefulness.
- **IQ Awareness dropping below the horizon.** It seems paradoxical, but if the IQ management is smoothly integrated to the business operations, the elimination of the associated risk leads to a loss of the sense of importance. As IQ reports show all indicators to green, so why bother anymore? Focus shifts, slack installs in IQ controls and the IQ trend flattens or reverts. As long as the Balanced Scorecard of key executives includes IQ metrics, this phenomenon will be self-regulated. If the management ceases to drive IQ, the organization may creep into an adjacent IQ Grid square.

**ROADMAPS TO INFORMATION QUALITY IMPROVEMENTS**

The initial conditions set by the position of an organization into the Information Quality Grid suggest which roadmap should be considered to reach self-sustainability. However, any IQ improvements approach share the same four Fundamentals to support the standardization effort.

I. **Implement information ownership.** The ownership of master data [9] is clearly defined for all information that matters to the organization (customers, products, suppliers, materials, technical know-how, etc.). A practical and efficient way to implement ownership is to set highly weighted IQ objectives and targets in the management’s Balanced Scorecard. Business ownership must be transparent and easy to understand: a multi-level ownership that is context-dependent is more likely to dilute the accountability than increase it. In practice, business users should be able to identify at a glance who to turn to when a question related to data arises. Business ownership must be communicated to the entire organization, with as few exceptions or hierarchical levels as possible.

II. **Establish data standards.** Setting data standards is a good way to return to the basics: what a customer, supplier or a product information record should look like everywhere in the organization [10]. For instance, it specifies how materials are numbered, how hierarchy of components is represented in product naming conventions and classification, how to properly name suppliers and customers, what are the credit rankings and the associated criteria, which address format to use, etc. The data standards should be common to the whole organization and be IT system - and process-independent. It may seem obvious but when the same information is held by multiple systems in various formats, even the most knowledgeable person will have difficulty identifying which set of information is the most suited to support business needs. If available, it may be useful to apply existing international data standards (e.g. Dunns & Bradstreet for customers and suppliers). If not available, it will require to get together members of various parts of the organization and to have them to establish a common set of requirements. These data standards are compiled into enterprise data guidelines, which the business commits to comply with. The data standards must be simple, easily available and constantly maintained as it is the basis for the measurement and control of IQ.

III. **Document the data definitions.** Data definitions stipulate how the data standards are implemented in the various IT systems. They describe the technical and business rules to maintain the data. Technical rules - often called metadata [11] - include field-level characteristics such as, for instance, type of data,
structure, field length, database identification, mandatory and uniqueness characteristics, etc.… Business rules indicate for instance: allowed and default values, naming conventions, context rules - what value to use in which case - business validation rules, data ownership and who maintains it, etc. These definitions are published and constantly updated to reflect the requirements of the business operations and their supporting IT systems. Defining what the data users and/or maintainers must aim at is the prime value of comprehensible data definitions.

IV. Implement data maintenance processes. The data maintenance processes describe how the information is created and maintained harmoniously despite the organization’s compartmentalization. Compliance with the already agreed pre-requisites such as data standards and definitions is enforced. Whether the organization is process-based or function-based, data is completed in sequence by several individuals with various skills and knowledge area. The complexity of today’s business processes and their related IT systems makes unlikely that a single individual retains all the knowledge to own and maintain all aspects of the data - finance & controlling, production, logistics, tax, etc..... A reliable approach consists into concentrating the data maintenance responsibility into fewer, more knowledgeable and qualified hands [12] who know where to seek missing information elements. The data maintenance process itself is clearly documented to ensure the knowledge retention and transfer. Checks points are inserted in the information workflow where data is systematically corrected when needed, according to clear rules - e.g. when creating an order for a customer whose last transactions dates more than 3 months, verify address and payment information - and according to pre-defined Service Levels Agreements [13]. Data maintenance processes are essential to secure IQ knowledge retention and to maintain in the long run a suitable level of IQ.

Having these four Fundamentals understood and set, fully or partly, the organization can execute the appropriate roadmap.

A 10-step roadmap for “Blissfully Unaware” organizations

“Blissfully Unaware” organizations suffer both from little awareness and continuous erosion of IQ. Business disruptions caused by inadequate information quality is blamed on other causes. Raising awareness alone - and failing to “walk the talk” - would push the organization into the “Frustrated Crowd” square of the IQ Grid, while a top-down drive to IQ would likely drive a lift up to “The Drain” area. It is recommended to adopt a cautious strategy of small steps, each bringing concrete results that can be leveraged to increase the overall business support in a controlled way.

The saying that “every journey starts with a single step” is especially true in this case. As there is a lack of business drive, it may difficult to mobilize the organization into moving towards the right direction. A good approach is to find a single, limited area for IQ improvement, where a positive business case can be identified and its results measured.

1. **Identify a positive IQ business case.** A business case clearly demonstrates causality between low IQ and adverse business impacts [14]. The benefits are sought in the elimination of unnecessary steps in the value chain (e.g. data checks associated to frequent corrections). The IQ improvement projects are justified through business cases, where investments are offset by the expected benefits. The ambition level must be realistic and cautiously defined [15].

2. **Set-up data ownership, standards and definitions.** It consists in implementing these three Fundamentals within the project scope. When the information entered satisfies all these requirements, it can be assumed correct from a business standpoint. This step can be applied to a sub-set of data as the roadmap will likely require several iterations.
3. **Measure initial IQ level.** The data standards and definitions being agreed, Information Quality becomes an objective measurement of the compliance with the requirements. Whether it is through sampling or systematic measurements through database reports, it shows clearly the initial situation, allowing the Business management to refine the ambition level for the IQ improvement. The evolution of the IQ level determines the IQ trend.

4. **Set-up data maintenance processes for IQ sustainability.** Sustainability is secured by the implementation of clearly defined data maintenance activities within the business processes. This may require the set-up of a specific organization dedicated to data maintenance. While IQ improvement programs are underway, ongoing business operations are focusing in creating and updating good quality information, using the data standards and definition, under the owner’s responsibility. Failure to implement these processes will push the organization into “The Drain” square while endangering the business case.

5. **Execute IQ improvement project(s).** At this stage, business operations should include practical IQ control. However, the history of inadequate information quality still weights down the systems. Targeted cleansing and elimination of obsolete and irrelevant data can be performed to accelerate the rate of IQ improvements. The critical success factor lies in the commitment of the business ownership to design and approve the IQ improvement process and to validate its results.

6. **Measure the IQ development.** The improvements between the initial and spot IQ measurements - using identical criteria - demonstrate how successful the project is. Lower-than-expected results should lead to a refinement of the processes and IQ improvement methods.

7. **Assess the IQ business benefits.** The management should be in a solid position to demonstrate the concrete savings associated to the IQ improvement e.g. headcount reduction, claims reduction, acceleration or improvement of end-of period reporting. These results will build confidence for further IQ improvement initiatives as well as provide solid ground for IQ awareness improvement communications [16].

8. **Communicate the IQ results.** A communication based on tangible results of concrete internal initiatives is always more effective than the ones based on theories, benchmarks, best practices or fairy tales. The aim is to raise awareness outside of the area immediately impacted by the project, attracting the attention on IQ benefits.

9. **Use increased awareness to identify new business cases.** Increased awareness is a good lever to generate new IQ improvement demands, allowing for additional loops to the first step of the roadmap. Each iteration is easier to sell than the previous one as the business will gradually move from a “push” mode, to a “pull” one. In practice, IQ and awareness will rise together.

10. **Consolidate the results.** Individual IQ improvement projects implement a subset of the four Fundamentals; disconnected or silo-based initiatives will generate conflicts and contradictions. The organization needs to group and federate scattered departmental information ownership, data standards and definitions under a single, united IQ umbrella. The business case of this consolidation lies in the reduction of the IQ management overhead.
A 6-steps roadmap for “The Drain” organizations

“The Drain” organizations want to increase the efficiency of their IQ-related investments endangered by the poor data quality the daily business operations generate. Such organizations typically suffer from lack of business ownership, excess of centralization, poor communication of data standards and definitions and inadequacy of information maintenance processes.

Sustainability can be reached by guiding the business into a permanent IQ mindset. It requires setting the IQ accountability back to the daily operations and establishing and enforcing the adequate IQ targets (standards, definitions and processes).

1. **Identify missing prerequisites and complete the gaps.** Organizations in “The Drain” are missing some of the Fundamentals. The first step is to seek any gap and assess its impact. A certain amount of roll-back and “getting back to the basics” may be necessary, with emphasis on the data standards and definitions.

2. **Check and amend the organizational model (ownership and maintenance roles).** The ownership structure is revised, ensuring the owners do have an effective control on the IQ generated by the day-to-day operations. The Balanced Scorecard is adjusted to reflect the weight of IQ, making the individuals feel responsible through incentive programs. When the data maintainers are compelled to follow the rules set by the owners, the IQ trend will curve up.

3. **Communicate goals and motives.** The management communicates its intent at every level of the organization, highlighting the reasons why the previous strategy has been changed. The communication will emphasize that compliance is compulsory.

4. **Set-up processes for IQ sustainability.** The critical success factor lays in the successful implementation of the IQ sustainability processes to “plug the leak”. Compliance to data standards and definitions is guaranteed and measured by adequate processes and workflow tools. Initial stages of the implementation require strict discipline enforcement that can be relaxed once business has committed to be accountable for IQ.

5. **Monitor for effectiveness.** As in the “Blissfully Unaware” roadmap, IQ evolution can be
measured. In this case, the key measurement comes is the reduction in the level of spending in IQ improvement projects. Once set, processes are less expensive to run and the need for costly one-time quick fixes should drop significantly.

6. **Use increased awareness to expand success.** The success of the initiative is used to vindicate the original IQ investments, bringing the necessary hindsight and justifying the consolidation of the initiatives into a broader framework.

### Roadmap for “The Drain” organizations

<table>
<thead>
<tr>
<th>Selling arguments</th>
<th>Watch points</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reduced investments.</strong> Most of the heavy IQ investments have already been financed. Completing and refining the Fundamentals and implementing IQ management processes are resource-intensive but do not require large cash-out investments.</td>
<td><strong>Focus on change management.</strong> The roadmap is all about change management as the main technology elements are already in place. Focus must be kept in identifying change drivers, establishing the change catalogue and delivering training.</td>
</tr>
<tr>
<td><strong>Incremental approach.</strong> The roadmap does not require a dramatic strategy shift. It aims to complete the already existing initiatives, expanding their scope and increasing their effectiveness.</td>
<td><strong>Business reluctance.</strong> As significant past investments have not brought the expected results, criticism can be expected and need to be addressed constructively. Management should acknowledge there were missing elements in the original concept that have to be addressed.</td>
</tr>
</tbody>
</table>

### A 5-steps roadmap for “Frustrated Crowd” organizations

“Frustrated Crowd” organizations suffer from poor-IQ induced pain coupled with too little “action”. Executives will likely find warm supporters and champions in the organization to transform this goodwill into a mobilization towards IQ sustainability.

Such organizations have probably launched numerous and uncontrolled IQ improvement initiatives due to lack of a common IQ framework. The resulting landscape is suffering from lack of inter-operability. Quick definition and adoption of standards associated with the formalization of the Fundamentals will help bringing order in the chaos.

1. **Set-up data ownership, standards and definitions.** The existing situation is caused by a critical absence and/or over-fragmentation of some of the Fundamentals. The completion of this step is critical to align the entire business towards common, compatible IQ targets.

2. **Survey the IQ landscape and identify consolidation options.** The data is scattered and supported by scores of un-coordinated systems, each aiming to solve a specific range of business issues. They may bring limited-scope success but are getting in the way of each other, preventing the implementation of organization-wide sustainable improvements. It is necessary to federate the solutions into a more limited and controllable sets. This can require significant IT investments and important business change management efforts.

3. **Set-up processes for IQ sustainability.** The temptation to engage as soon as possible in information cleanup has to be controlled. While the chaos still rules, any attempts to cleanse the improper data will conflict with the current uncontrolled maintenance. It is necessary, as in “The Drain” and “Blissfully Unaware” segments to implement first the processes to create and maintain clean data before cleaning the already existing information.
4. **Perform cleanup while migrating to enterprise IQ landscape.** Consolidation of the information into a smaller set of systems justifies a one-time data cleansing effort. Data that is no longer relevant, duplicated or too incomplete is removed. The standards and definitions define targets to complete, fix and harmonize the data and accuracy checks are performed as needed.

5. **Monitor results and take appropriate actions.** A clear and objective assessment of the initial Information Quality state is difficult to establish as there is a lack of common baseline. IQ improvements measurements can only be indirectly measured through the reduction of the business pain level. Once the new landscape is in place, objective IQ measurements can be set to monitor the IQ trend and define the appropriate next steps.

<table>
<thead>
<tr>
<th>Selling arguments</th>
<th>Watch points</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Business Goodwill.</strong> The business may just be desperate enough to accept any important effort in implementing the IQ sustainability model. It will endorse more easily the compliance to the Fundamentals than less aware organizations.</td>
<td><strong>Manage chaos.</strong> Over-eagerness may lead to conflicting, chaotic IQ improvement projects popping up all over the place. The initial situation may include a patchwork of existing projects, tools and initiatives, de-coupled from each others, which may solve punctual issues but add to the general entropy by lack of standardization and coordination.</td>
</tr>
<tr>
<td><strong>Big benefits.</strong> Although difficult to establish at a global level due to the complexity and fragmentation of the business case, alleviating the pain should generate obvious punctual benefits. Even a patchy aggregated benefit case should be sufficient to justify the important one-time investments necessary in this roadmap.</td>
<td><strong>Late standards adoption.</strong> The first priority is to secure the enterprise data standards and definitions to provide guidance and start to align the entire organization on the same targets. Later adoption of standards will also lead to important costs of rework.</td>
</tr>
</tbody>
</table>

### A 3-activities path for “Self-Sustaining” organizations

“Self-sustaining” organizations aim at remaining focused on IQ sustainability to preserve their optimal situation. It is not a transition roadmap, but rather a path of maintenance, securing long-term success factors such as enduring management commitment, preservation of knowledge, ingraining the strategy in the enterprise culture and making IQ a “natural” characteristic. Self-sustainability requires adaptation to ever-changing business environment, the Fundamentals being secured and aligned towards the business needs.

1. **Maintain the current state.** The key challenge is knowledge retention. The documentation should trap any required change in the standards and make them available to the whole organization. Employee turn-over is compensated by adequate knowledge transfer and training programs. The Information Quality model is ingrained in the enterprise strategy and values as a key pillar. Sponsorship at senior level is constantly set and the Balanced Scorecard reflects the importance of IQ sustainability.

2. **Identify drivers for change and apply changes.** The main drivers affecting Information Quality are related to change of business conditions (affecting data standards and definitions), organizational changes (impacting data ownership and processes) and IT system’s modifications (requiring adaptation of data definitions). These drivers must be identified as early as possible and the revisions of the IQ sustainability model included as part of the implementation of the overall


4. Communicate and report. Once self-sustainability is achieved, regardless of the initial state, IQ may drop out of the organization’s risk map. As it becomes natural to have high IQ, awareness tends to drop. The management needs to maintain attention through periodic communication, IQ reporting or high-profile projects.

The roadmap to self-sustainability has most probably been long and painful, but it has brought significant improvements in the execution of business operations. Justification of the continued costs for IQ lay in the preservation of these advantages. A well-designed self-sustaining IQ process does not require high maintenance costs and its proximity to the business should ensure it is permanently perceived as a value-adding activity.

CONCLUSION

Contrary to largely distributed preconceptions, achieving long-term adequate Information Quality does not require extra-large investments nor should it be a pure IT-driven activity. On the opposite, significant investments may prove counter-productive as they fail to gain traction within the business. Similarly, when IT department takes care of the IQ issues it often leads to a larger effort and a risk to focus on the wrong priorities due to misunderstanding of the requirements. All together it will contribute to a failure in delivering what the business expects or needs.

Establishing a solid foundation with well defined information ownership, enterprise data standards, business definitions and suitable data maintenance processes is the most effective way to reach self-sustained Information Quality. Precisely, it places the responsibility where the knowledge is. This in turn can enable achieving high IQ with lower and transparent costs.

The roadmaps to Information Quality’s self-sustainability require focusing on incremental change management rather than on IT spending. The stepwise approach enables gradual build-up of IQ at a reduced risk and financial exposure level. The organizations endorsing such approach will be more eager to engage into IQ improvements initiatives, having secured strong business support as a precondition to execution. Thus, the quest for IQ excellence becomes an efficient tool in the hands of the savvy executives to achieve increased organization competitiveness.

REFERENCES & AUTHOR’S NOTES

Fixing data in an integrated ERP environment is much more expensive that keying it right the first time. It can reach up to 7 to 20 times more than initial entry as master data is often locked by open transactions or active stock. Fixing wrong data at transaction time may also require canceling all open activities, going back to data maintenance screens and fully re-executing the transactions. When considering engineering-to-order activities, a single information quality issue may cause the loss of days of work.

Master data or key data can be roughly understood as the representation in the business systems of real-world entities and objects that supports an organization’s activities: customer, suppliers, base materials, products, etc. Transactional data represents the operations done with them.

It describes how the enterprise conceptualizes its information according to its specific business context. A supplier of toothpicks will want to represent its product information in a different way than an aircraft manufacturer.

Data about data. Metadata describes how, when and by whom a particular set of data was collected, and how the data is formatted. Metadata is essential for understanding information stored in data warehouses and exchanged across different IT systems [definition adapted from ISP Glossary]

The less people are involved in the data maintenance the better the traceability and the accountability can be established. Higher repeatability of data transactions by concerned individual guarantees better information consistency. Non-maintenance users should be locked out of the data creation and update transactions while simple workflow tools or processes enable them to channel their requirements to the information owner. Then data is verified, accepted, amended or the request is rejected. Eventually it will reach the maintainer who will apply the changes according to the data standards and definitions. Sophisticated workflow tools exist but they do not necessarily add value compared to simpler, cheaper, better designed ones (in small organizations, a paper-based workflow is often good enough).

Service Level Agreements (SLA’s) set for instance how long it will take for the central data maintainers to have the necessary data entered into the IT system. It defines the level of service a central organization will be measured on and may also indicate emergency procedures and the escalation path in case of non-compliance. SLA’s are vital for data maintenance organizations to secure business credibility and acceptance.

Obvious sources for benefits are loss of business e.g. failed orders or erosion of margins or claims-induced costs. Usual troubled areas are: order processing (double-checks of ordering information, end-of-period reporting), duplicate handling of suppliers and customers, correction of reports due to faulty data and customer-related claims due to wrong deliveries. As the issues resolution is often blended with the day-to-day activities, ferreting out the right example requires some fair amount of process analysis. Once a suitable collection of examples are found, it is necessary to assess the gain that partial and total IQ improvement would bring and then select the most obvious (or the least disputable one) in a realistic manner.

Total quality ambition targets are likely to be out of reach, it is then advised to set first limited ambition levels. The scope should be broad enough to be representative of future IQ improvements and small enough to not scare the business away and for its execution to remain manageable. Once the case is found, bringing it to the attention of the management as a limited initiative may be a good tactic, at least in the initial stages. The main “trick” is to include in the project execution all the necessary steps to contribute to the long-term self-sustaining IQ model, showcasing the whole IQ improvement process.

The initial IQ improvement project will not carry the full extend of the anticipated benefits. This is the reason why ambition levels should be carefully set during the business case construction phase, and deviations should be used as a basis to refine the assumptions to be used in future projects.