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Jared Armstrong

Building value through a GIM strategy

As thermal and coking coal prices continue their downward trend, many coal mining organisations are focusing on building value through process improvements to increase efficiencies. By improving processes, productivity is impacted, projects are de-risked and opportunities uncovered. This strengthens the value potential of projects.

Geoscientific information[1] is a vital asset which underpins the value building process. It is the life-blood of exploration, planning, engineering and production. It is vital for decision making and required when reporting and communicating with external stakeholders. It is also a key driver of the value potential of the organisation.

Poor performance in Geoscientific Information Management leads to inefficient process, a lack of internal and external confidence and an overall high risk of major business problems. From over 10 years geoscientific information management in the coal industry globally we have seen poor performance in GIM lead to:

- **Lower than expected recovery**
- **Information loss resulting in significant devaluation of assets**
- **Major disruption of information flow negatively impacting production**
- **Duplicated effort and duplicated datasets because of information 'silos'**
- **Expensive re-logging, re-sampling and re-drilling of projects**
- **Lack of faith in resource estimates**
- **Significant wasted resources from digging in the wrong place**
- **Inconsistent and inaccurate production forecasts**
- **Reduced confidence in project valuations**.

acQuire Technology Solutions has worked with industry to develop a practical guide for assessing the maturity of an organisation's Geoscientific Information Management process.

The guide is designed to create a suite of findings that reflect how well the organisation is performing relative to objectives and compared with current industry best practice. The findings provide the customer with an action plan aimed at maturing its GIM process which assists in achieving and maintaining compliance with the organisation's Corporate Governance and Risk Management Policies.

Ultimately the goal of maturing the Geoscientific Information Management process is to better support the value building process for coal miners and other energy organisations.

[1]In many contexts **data** and **information** are considered synonyms. However **data** itself has no meaning, but becomes **information** when it is interpreted. **Information** can be considered as a collection of facts or **data** that is communicated. **Data**, by the way, is the plural of datum. **Information** comes from Latin *informationem* meaning 'concept', 'idea' or 'outline". (http://dictionary.reference.com/help/faq/language/d58.html)
In the context of this paper **data** refers to original observations and measurements whereas information refers to data that has been verified, contextualised, signed off.

INTRODUCTION

As thermal and coking coal prices continue their downward trend, many coal mining organisations are focusing on building value through process improvements to increase efficiencies. By improving processes, productivity is impacted, projects are de-risked and opportunities uncovered. This strengthens the value potential of projects.

Geoscientific information is a vital asset which underpins the mining value chain. It provides the control points which define the size, grade, quality and location of the resource assets that companies own. It flows through to the understanding (or perception) of economic opportunity and risk, and underpins shareholder value.

Geoscientific information comprises original observations and measurements of the in-ground business assets, obtained through surveying, drilling, sampling, and testing.

Any loss of faith of business managers in the data asset or inability to access their in-ground data in a form that provides meaningful insights means opportunities for improvement in business performance are missed. Several pillars of Geoscience Information Management need to be in place for managers to better connect with GIM related value potential:

- Process. Must be established and followed to ensure geoscientific data that is collected is of high quality and the significance of data from different sources is understood.
- Single source of the truth. There must be a business-wide imperative to collect and manage the data for the express purpose of producing a single trusted master data set of which the quality and value increase over time.

- Interrogation. The ability to quickly derive information from the data to inform value building decisions.
- Visibility. That information must be in an appropriate context and easily and regularly accessible by both the technical and business teams.

For many organisations, progress in achieving and maintaining the above pillars increases the potential for organisational success which can be achieved through a sound, Geoscientific Information Management (GIM) *strategy*.

The *Data strategy* impacts both the technical and business teams. It's a responsibility that sits in the centre of both domains. A Venn diagram is a good way of expressing this. We often think of these two domains as existing in separate silos but the middle-ground is where technical and business teams have the greatest potential to work together in identifying and developing opportunities and mitigate risk.

Hence, we need to re-think *data strategy* as belonging to both the business and technical teams within our organisations.

Geoscience and data science teams are full of wonderfully smart, curious, and very capable people. Often these teams pursue and conquer challenges simply because they can and because they are interesting. However, in spite of their abilities, the value of these challenges are not always tied to the needs of the business.

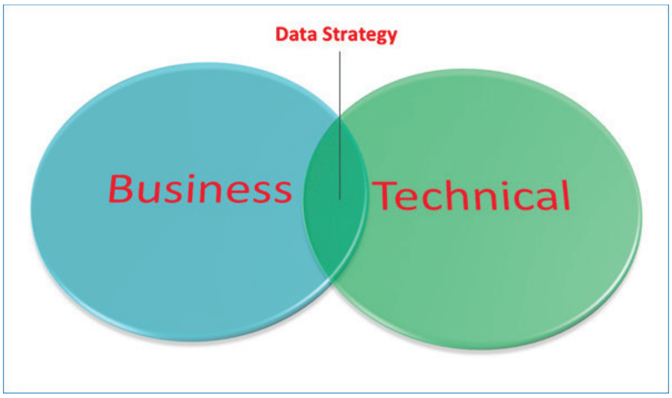

Figure 1: Venn diagram showing intersection of business with technical departments.

So what is the answer? As Julie Steele from Silicon Valley Data Science put it, you need to find the "Zen of the Venn" (Steele, 2015).

This paper explores ways to bring the often perceived "obscure" and seemingly irrational and unquantifiable technical world of geoscientific workflows into the light of a business framework. Specifically, these workflows encompass gathering, validating, governing and publishing relevant geoscientific data.

What is a Data Strategy?

The term 'Data Strategy' takes it origins in more recent years from within 'Master Data Management' (MDM) popularised to some degree by Microsoft and Gartner (Radcliffe, 2007). It has only taken root in the corporate business world in the last 15-20 years. A brief progression of that history follows.

Master Data Management (MDM)

Unlike transactional data, master data is your **business critical data** often stored in disparate systems spread across your enterprise. Sometimes referred to as "data assets".

For coalminers and explorers the definition and optimal extraction of mineral resources is their core business relying to a large degree on samples, drill holes and other control points such as pit surveys.

Master Data Management as a discipline incorporates people, processes, technologies and methodologies that combine together to build a single, accurate and authoritative view of these assets (Hazejager, 2012). Inevitably for more geographically diversified organisations it may include the use of Big Data and Business Intelligence (BI) technologies.

History

1. MDM first was about a single source of truth. Master data means the master version or the original version of the validated 'truth' that one could always go back to and reload or ask questions of or copy down to one's local computer. Originally it referred specifically to accounts and financial data.
2. Following the management of master data, the concept of multi-domain MDM emerged. The idea was to extend the principles of management of master data to departments within the organisation other than the finance department. Multi-domain MDM provided a single technology stack for managing data across many internal groups and functions, to integrate a single views of customers, products, suppliers, employees, assets, locations and more (Stibo Systems;, 2014).
3. Then came the concept of data governance. This introduced the concepts of permissions and access rights, validation at the point of capture, master references in place. Governance included a formal process known as "stewardship", in which roles and responsibilities were commensurate with the levels of authority and accountability in the organization. (Radcliffe, 2007).
4. Now we are seeing a growing requirement for greater efficiency and more value from data across the enterprise. Delivering that value requires business and technically savvy people that understand the process and benefits of good data stewardship. The chief data scientist is fast becoming a pivotal role in the organisation management of organisations serious about treating data as an asset. Roles filled by such people focus on the management

and oversight of an organization's data assets with the view of "helping provide business users with high-quality data that is easily accessible in a consistent manner" (Wikipedia Contributors, 2015).

A modern-day MDM approach includes elements of each aspect. A simple Google search will reveal countless providers of such services including Radcliffe (2007). MDM is now recognised as a technology-enabled discipline in which business and IT work together to ensure the uniformity, accuracy, stewardship, and accountability of the enterprise's official, shared master data assets. By engaging in a MDM strategy, you are well on your way to finding the Zen of the Venn!

Essentially MDM principles can be applied to the natural resource industries. A specific component of natural resources relates to the management of original observations and measurements and was coined Geoscientific Information Management or GIM. So a GIM strategy is not just having a vision for the most efficient way of managing mining geoscientific data but having a plan in place to fulfil and maintain this vision into the future.

PROBLEM

For any business, a key challenge involves aligning teams with the shared business goals. This requires leadership, but also requires clear strategies to ensure quality data is captured and information in line with these business goals is extracted.

For coal miners it is an even greater challenge because:

- Teams and managers work remotely from each other
- The industry has a relatively high turnover of people
- There is greater uncertainly due to price cycles and exchange rate variations, often necessitating a shorter term focus
- Business people not knowing or caring how to use the available geoscience data.

An observation: "a fish doesn't know it's wet". It is a reminder that we can become conditioned to just capturing and validating data, while losing sight of the opportunities within the data that may bring increased efficiencies and uncover new value opportunities. Sometimes we need a "view from the trees" approach to our own processes. This can lead to new ways of thinking about our information and processes resulting in new efficiencies and unlocking new opportunities.

A GIM strategy is essentially a specific kind of data strategy designed to mitigate these problems partly through the provision of a governance framework. Before we focus on GIM strategy, let's consider what can go wrong when a GIM strategy is not in place.

Classic examples of failed GIM strategies in the coal industry

With the many years of interacting as a vendor with geologists from coal mining organisations all around the world, interesting stories tend to emerge.

The two examples that follow are deliberately vague to protect the interests of the company referred to. However they are examples of what can go wrong when geoscience data is not considered as part of the planning process and value strategy of a coal mining organisation.

First story

The author was present during a meeting between the authors company and a coal miner that was curious about investing in a corporate, enterprise wide GIM technology. During the meeting, the Chief Geologist and the Manager of Technical Services explained how in the recent past, their company had *lost the coal quality data for 5,000 drill holes,* essentially the company's entire drill hole data repository for the past 15 years. This was due to a hardware (i.e. disk) failure. Although the storage in question had a back-up strategy, the back-ups that were supposed to occur were not occurring and were never tested with the view of 'disaster recovery'.

The result was that the company only managed to recover some, but not all of their data from the failed hardware. Furthermore, a percentage of the data that was recovered was compromised and has questionable validity. Replacing 10% of their lost data even using conservative drilling costs represents many tens of millions of dollars in today's terms. As a consequence it unlikely this data will ever be replaced.

Second story

During interaction with a customer during the mid 2000s, it was realised they had a poor system for tenement tenements. In fact they had no system at all. As a direct result tenure held over prospective ground was lost, drilled out and turned into an operating coal mine. The company also had issues with being able to clearly report on rent, renewal & relinquishment dates and any meta-data related to these tenure management activities. A system was built that better facilitated their tenure management and aligned tenure management with their business needs.

This customer has since developed a GIM strategy of their own.

Table 1. Maturity Index Summary

Maturity Index Description	Index rating
Ad Hoc - No Formal Procedures. Process performance depends on individuals & varies with their knowledge and skills. GIM not reflected as a corporate issue.	0 - 1
Awareness – Good practice is beginning to be leveraged. Some processes are repeatable with consistent results. Aware of importance of GIM as a corporate issue but not formalised.	1.1 – 2
Understanding - Attempts to formalise procedures and collaborate with others. Results are more consistent and repeatable. Aware of importance of GIM as a corporate issue and some degree of formalisation.	2.1 – 3
Competence - Formal Procedures are in place and adequate solutions are in operation. Results are consistent and repeatable. Aware of importance of GIM as a corporate issue and there is a framework in place.	3.1 – 4
Optimised - Formal procedures and solutions are in place that drive efficiency, increase productivity and enable the business to continually improve. Aware of importance of GIM as a corporate issue and there is a framework in place.	4.1 – 5

A GOOD GIM STRATEGY

A good GIM strategy should have the following points covered:

- Start with a clear and compelling business case
- Be aligned with the organisation's strategy
- Have executive level sponsorship and broad stakeholder engagement
- Include metrics that inform the business how well the business is performing in regard to its GIM Strategy
- Have a governance framework.

GIM Strategy overview

Geoscientific Information Management (GIM) is an essential function of any coal mining company. It is the foundation of many other processes. It is the life blood of exploration, planning, engineering and production.

A resource is defined by the quality and quantity of its geoscientific data which:

- Is expensive to collect and is difficult to manage.
- Represents both the greatest opportunity and the biggest risk.
- Defines value and shapes the future.

It includes data capture, data management (verification and security) and data delivery/accessibility (to users and systems).

A GIM Strategy recognises that GIM is a corporate performance and risk management issue; it is fundamental to achieving business wide objectives and optimising processes. Included within the framework is a clear corporate GIM policy which helps position GIM appropriately in terms of both organisational and operational priority. The GIM Strategy, when supported by viable GIM technologies, will enable the organisation to improve the practice of Geoscientific Information Management and to implement a long term sustainable solution (Alpers & others, 2015).

The GIM Assessment—a simple and practical starting point

A GIM Assessment is a practical and procedural approach to determining the maturity of an organisation's Geoscientific Information Management; relative to the standards and objectives set by the organisation's management team. The overall maturity of the organisation is rated out of five (5) by assessing eleven core activities involved in managing Geoscientific Information on a site or within an organisation. The purpose of the exercise is to uncover opportunities for productivity improvement and to reduce operational and corporate risk. The particular assessment is designed to provide coal miners and explorers with an action plan aimed at advancing their current Geoscientific Information

Management maturity and maintaining compliance with the organisation's Corporate Governance and Risk Management Policies.

A GIM Assessment focusses on eleven core activities and considers how people, process and technology are aligned to ensure process optimisation and sustainable business practices. Underpinning the assessment is a maturity Index which enables a structured review and comparison of GIM activities compared to a predefined benchmark, which has been developed by acQuire over the last two decades. The following table outlines the description and rating for each index of the model.

Approach

Key stakeholders are interviewed using a questioning discovery technique to understand the current maturity of each core activity. The first step is to recognise the issues and associated implications already identified by the stakeholders. Further enquiry is used to identify any additional issues not already recognised by the stakeholders and their likely implications. The success of this exercise can only be achieved in consultation with key geoscientific staff on site that are involved in the execution of GIM processes.

The assessment covers the following eleven (11) core activities:

- Drillhole Planning
- Drilling Execution
- Project Cost and Performance Monitoring
- Drilling Sample Selection
- Sample Collection
- Materials Handling
- Sample Submission
- Sample Analysis
- Geological Logging
- Geotechnical Logging
- Discovery, Reporting and Resource Data Delivery.

The responses from the stakeholders for each activity are rated by both the acQuire representative and the nominated company stakeholders. A weighted average is then calculated based on the number of respondents, and an overall score per activity is assigned. The rating per activity is categorised based on clearly defined maturity stages that coincide with a logical capability growth plan. These categories allow acQuire, in conjunction with the stakeholders, to understand the sites overall GIM maturity. The findings and recommendations from the GIM Assessment are then presented.

An example sheet for the first activity 'Drillhole planning' is shown in Figure 2.

Typical reports.

The chart below (Figure 3) indicates an example of a 'score' for each of the 11 assessed activities which highlight key areas for improvement. It is important to note that the results are based on feedback from key stakeholders within a current mining company about their current GIM business practices; and no inference or assumptions are made. Stakeholders from the corporate office and the mine site were interviewed.

Three activities which received the lowest scores include

- Project cost and performance monitoring
- Sample collection and
- Materials handling.

All three are at the 'Awareness' stage, showing significant opportunity for improvement. This allows the business to target these activities and increase GIM capability.

Another way of viewing the results at an even higher level is taking the overall summary and plotting as can be seen in Figure 4.

CONCLUSIONS

Geoscientific information is the lifeblood of the value creation process organisations involved in the discovery, development and extraction of energy resources. A mature GIM Strategy helps the technical and business teams to work together to achieve the goals of the organisation.

The concepts underpinning GIM strategy are not new. In other industries these concepts are called Master Data Management and attempt to integrate data management across the whole enterprise in such a way that deliver risk reduction and unlock value.

A GIM strategy should support the organisation's business objectives relating to building value. A GIM Assessment is a guided self-assessment methodology enabling an organisation to assess their GIM maturity. Actions aimed at establishing and consolidating the GIM strategy are an important outcome of this assessment.

A GIM assessment divides GIM into eleven (11) core activities with a maturity score as an outcome. This GIM score can be expressed as a number for each core activity or as a single all-encompassing value representing the GIM maturity of the business.

A GIM strategy analyses people, process, methodologies and technologies utilized within a mining organisation. It provides a framework for establishing the importance of GIM as a corporate performance and risk management opportunity. It enables a mining/exploration business to see clearly what needs to be done in order to achieve the level of GIM maturity required to supports its business goals.

Drillhole Planning

DEFINITION

The *Drillhole Planning* Activity designs and prioritises the locations and orientations for planned drill holes. Each planned drillhole has a purpose and a theoretical target that fulfils the objectives of the drilling campaign. Usually, spatial, geological, logistical and economic factors are considered during this Activity.

ACTIVITY OPERATOR (Tick one or more options)

☐	Shared support staff	☐	Mining professional	☐	Other
☐	Dedicated support staff	☐	Contractor	☐	None

ACTIVITY DESCRIPTION

Detail	Y / N
Is there a single master list of planned drill holes?	
Do drillhole changes only occur in a single master list?	
Is a drillhole defined by its collar, total depth and orientation?	
Are planned drill holes designed in a mine planning package?	
Are cross sections used during the planning stage?	
Are geological models used during the planning stage?	
Is a budget defined for a drilling campaign?	
Does budgeting use a copy of the planned drill holes?	
Are planned drill holes prioritised and scheduled?	
Does scheduling use a copy of the planned drill holes?	
Is the official budget/priorities kept in the master list?	

MATURITY INDEX (Tick the option that is closest to your situation)

Innocence ☐	Awareness ☐	Understanding ☐	Competence ☐	Excellence ☐
Planned drill holes are marked on 2D plots and entered into a personal XLS. Many copies are maintained by different staff members.	Planned drill holes are marked on 2D plots and entered into a shared XLS. There is an effort to coordinate changes between different staff members.	Planned drill holes are designed in a mine planning package and entered into a shared XLS. Budgets and priorities are calculated subsequently.	Planned drill holes are designed in a mine planning package and entered into a central database. Drill holes are exported to Excel and budgets are calculated separately.	Planned drill holes are designed spatially in a mine planning package and stored directly into a central database. Budgets and priorities are updated automatically after each change in the database.

IMPROVEMENT AREAS (Define issues needing attention)

Area *	Issue **	Likelihood ***	How bad? ****
Operator development and training		H/M/L	
Supporting systems and tools		H/M/L	
Operating procedures		H/M/L	
Data management practices		H/M/L	
Naming and identification standards		H/M/L	
Organisation and coordination		H/M/L	

* You may have more than one thing that can go wrong for a particular area. Repeat the area on the next line with a different issue.
** What could go wrong? *** What's the chance of it happening? (High/Med/Low) **** How bad could it get? (Really bad/ bad/ not too bad).

Figure 2: Example sheet for one of the core activities. In this case activity 1 is used.

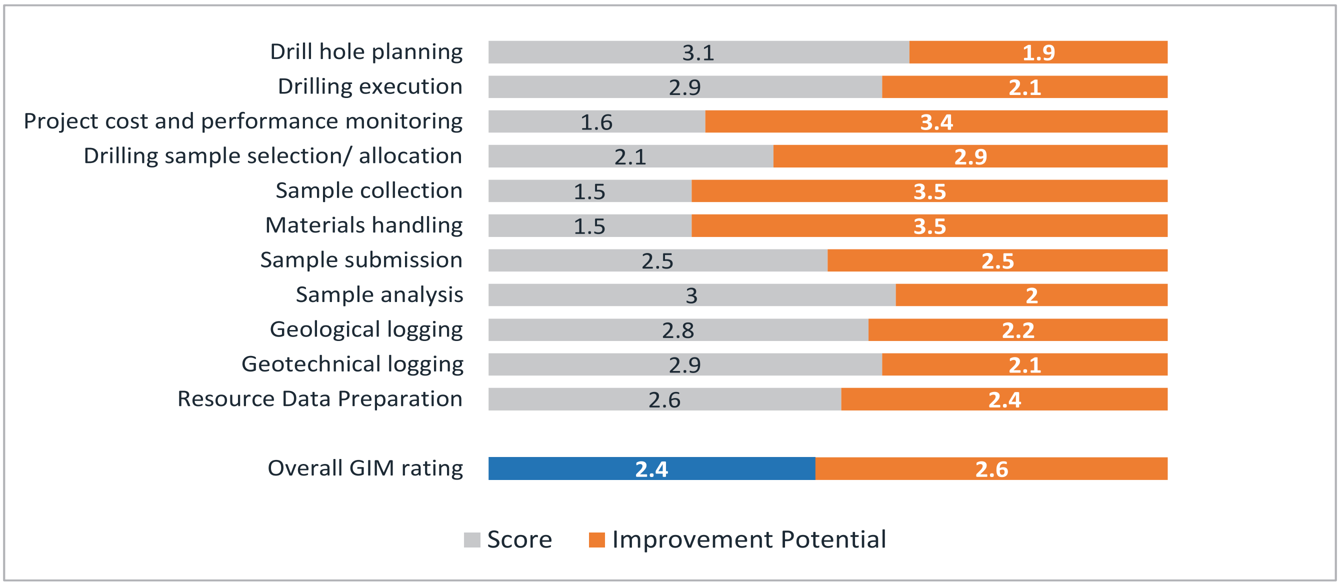

Figure 3: Activity Scores for each activity.

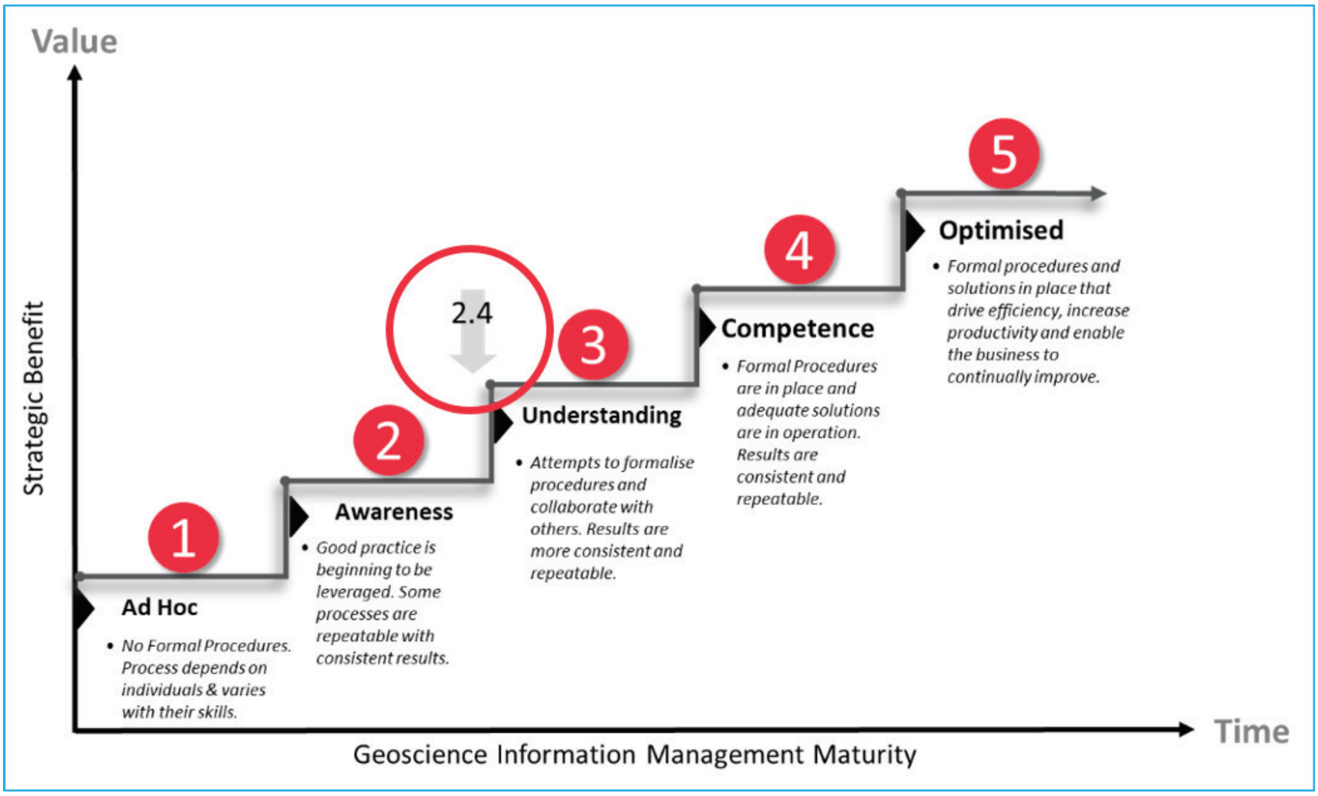

Figure 4: Activity scores as a single value

A GIM Assessment project can help organisations identify opportunities for business improvement through training, process management and fit for purpose technology.

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