Ten Golden Rules for Applying Life Cycle Information

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Abstract

We have seen rivers burning, marine litter growing, climate change impacts increasing, limited resources to name a few. Often our resources are directed towards actions which create unexpected impacts elsewhere, because we have not considered the full range of impacts along a product life cycle. Life cycle assessment has increasing become a tool of choice to understand the environmental and social trade-offs associated with product and packaging systems. What have we learned that can accelerate the generation and use of life cycle information to inform decision making? As we are approaching nearly 30 years of experiences, there is much still to do to develop the capacity and capabilities to generate and use life cycle information to ensure we are working on the right issue, at the right place in the value chain, and by the right groups. We see a future where products will be designed, manufactured, used and managed at the end of life in ways to create reduced environmental and social impacts than the previous generation. These innovative products will create business value, e.g., growing revenue, enhancing brand, reducing costs, and mitigating risk. All actors over a product's life cycle have a role. New business models will surface. These outcomes are happening now, but not at the scale needed. Based upon nearly 30 years of experiences, we have identified Ten Golden Rules for applying life cycle information. These will be described with examples and guidance on how they can be applied within your own organization.

Keywords: *Life cycle assessment, Life cycle information, Decision making, Golden rules, Life cycle management.*

Abstrak

Aktivitas manusia seringkali menimbulkan dampak yang tidak diinginkan karena seringkali manusia tidak mempertimbangkan dampak secara menyeluruh pada tiap siklus hidup produk yang diciptakan. Beberapa dampak negatif yang pernah terlihat adalah sungai yang terbakar, peningkatan sampah lautan, perubahan iklim yang semakin cepat, serta sumber daya yang semakin terbatas. *Life cycle assessment* (LCA) saat ini semakin banyak digunakan sebagai sebuah alat untuk memahami dampak lingkungan dan sosial yang diasosiasikan pada sebuah produk dan sistem pengemasannya. Apa saja hal yang telah kita ketahui dan dapat meningkatkan kualitas hidup generasi ini serta dapat meningkatkan penggunaan informasi siklus hidup (*life cycle information*) dalam pengambilan kepututsan? Setelah hampir 30 tahun penggunan, masih banyak hal yang perlu dilakukan untuk mengembangkan kapasitas dan kapabilitas penggunaan informasi siklus hidup. Pengembangan-pengembangan tersebut perlu dilakukan untuk menjamin penggunaan LCA secara tepat guna, pada bagian *value chain* yang tepat, dan pengelompokan siklus hidup yang tepat. Dibanding generasi sebelumnya, di masa depan akan semakin banyak produk yang didesain, diproduksi, digunakan, dan dikelola pada tahap akhir siklus hidupnya dalam rangkan mengurangi dampak lingkungan dan sosialnya. Produk-produk inovatif ini akan menghasilkan nilai bisnis baru, seperti meningkatkan pendapatan, mengurangi ongkos, dan mengurangi resiko, dan meningkatkan merk (*enhancing brand*). Model-model bisnis baru juga akan semakin banyak muncul. Hasil-hasil luaran tersebut sudah dirasakan walaupun skalanya belum sebanyak yang seharusnya. Berdasar pengalaman hampir 30 tahun, tulisan ini mengidentifikasikan '*Ten Golden Rules*' dalam mengaplikasikan informasi siklus hidup. Pada tulisan ini juga disertakan contoh-contoh dan panduan-panduan bagaimana '*Ten Golden Rules*' dapat diaplikasikan pada organisasi pembaca.

Kata kunci: *Life cycle assessment, Life cycle information, Decision making, Golden rules, Life cycle management.*

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1. INTRODUCTION

Over the last 30 years or so, there has been efforts to culturally embed use of life cycle information to enable companies to realize benefits such as to grow revenue, reduce costs, enhance brand and mitigate risks (which is referred to as business values); and at the same time, improve a company's positive impacts to the environment and to civil society – doing more good – not just less bad.

Business as usual, is no longer an option in the era of climate change, resource scarcity and population growth. We understand that today's complex, global value chains carry substantial risks and opportunities for almost all our products and materials that are integral to our livelihoods.

While there has been progress – there is still much to be done and additional challenges to solve – for example, marine litter is just one of those global impacts that were caused by how products are managed over their entire life cycle..

Actions are needed in a collaborative way by civil society, governments, and businesses to address plastics and other materials and products to develop solutions that reduce impacts to the environment without shifting burdens to another media such as land or air, and/or life cycle stage, beyond end of life.

Anthesis and Forum for Sustainability Through Life Cycle Innovation (FSLCI) are two or many organizations responding to support organizations to operate sustainably. Anthesis' serves as an Activator for delivering sustainable performance. FSLCI was created to help accelerate the use of life cycle information to inform decision making to ensure no burden shifting and to create business value while meeting society needs.

The purpose of the article is to identify and highlight those 10 golden rules for applying life cycle information to have an impact. Hopefully they will stimulate the readers thinking to identify actions that one can take.

1.1. Golden Rule 1 –*All products/packaging have some type of impact – there are no green products/packaging – only 'greener*"

Al Iannuzzi, who is the former senior director of product stewardship at Johnson & Johnson, wrote two editions of his book Greener products; the making and marketing of sustainable brand [1]. I had the honor to contribute to both editions. Al said it best:

"Whenever I speak about greener products, there are two things I usually say:

1. There is no such thing as a green product.

2. What good is a greener product if no one knows about it?

The reason for these assertions is that life-cycle assessments have shown that every product has impacts, from raw materials to transportation, manufacturing, customer use, and end of life. Every product can be improved in some way, which is why I use the term Greener."

When one reads a claim(s) about green product(s), it would be good to check about their claim and what was the basis for the statement.

1.2. Golden Rule 2 - *Products/materials/packaging can have multiple impacts*

The key to use of life cycle information is having the information that can inform decision making – let's take an example [2]. In this comparison, a Ford Thunderbird 1970 is compared to a Toyota Prius, 2015. The Ford Thunderbird averages in fuel consumption – 10 miles/gallon, weights 4400 lbs., is made mostly of steel, and is easy to recycle. The Toyota Prius fuel consumption is 50 miles/gallon, weights, 3100 lbs., is made of lots of plastics, battery, composites and electronics, and is a challenge for recycling.

The answer is obvious when you consider a carbon footprint of the two options–

- Ford gets 10 miles/gallon
- The Prius gets 50 miles/gal
- The carbon footprint in the use, production and end of life is significantly lower with the Prius
- If one is looking at CO2 as the criteria, then the Toyota Prius is the preferred solution

If we make the compassion on recycling only, the decision as to which is better changes

- The Ford Thunderbird is close to 100% metals – a scrap dealers dream
- While the Prius is made up of metals, composites and others – a monstrous hybrid
- In this scenario, the Ford Thunderbird – 1970 – is the preferred option.

This is a simple illustration of multiple impacts (e.g., carbon and waste/recycling). Normally the impacts to be considered are broader – e.g., water, toxicity, human rights. Clearly each product has its own footprint, life cycle information informs the decision makers. Only when a decision is made can there be burden shifting – in this example, supporting the Ford Thunderbird, one shifts the burden to increased carbon. But what is the preferred option?

That question raises another and critical point - Life cycle information does not make value judgements – it provides the information on which decision makers decide.

There may be no clear-cut guidance on what is good and what is not good, many opinions out there. One approach could be to engage stakeholders early and throughout the process, which is illustrated in

Golden Rule # 5 - LCA information is essential but not sufficient.

1.3. Golden Rule 3 – Products / packaging / resources should be managed throughout their entire life cycle – which often extends globally

The scope of materials stewardship encompasses both process and product related stewardship activities in key operations from mining to production through to end-of-life and recycling (Figure 1). There are two key stewardship elements in materials stewardship – each of which have different focuses and actors:

Process stewardship (represented by the green arrow)

- Process stewardship refers to activities undertaken by a company to ensure that its processes to explore, extract and refine minerals and metals are done in a way that minimize environmental impacts and health and safety risks
- At this primary stage stewardship activities are focused more on efficiency, productivity of resources and minimizing environmental, health and safety risks.

Product stewardship (represented by the blue arrow),

- Addresses the minerals and metals utilized in product systems by others, and refers to activities that influence or guide their application to minimize environmental, health and safety risks and enable recovery, reuse or recycling, as appropriate
- Responsibilities at this stage include supporting appropriate applications and facilitating efforts towards recovery and re-use as appropriate
- This stage involves many more actors in the value chain. For example, choices made by product designers and engineers (e.g., material and process technology selection) can have significant influence on a product's overall environmental impact, and these actors can therefore be important players in implementing materials stewardship strategies.

It is important to understand the full value chain of any product, packaging, or resource being investigated. For any efforts, one of the first steps is to map the value chain. Figure 1 is an illustration of such a mapping.

1.4. Golden Rule 4 - *We must focus and act on the right impacts at the right life cycle stage*

A hotspots analysis methodological framework was developed by UNEP [4]. The work was based on the following five premises:

1. Making sure we are working on the right issue (e.g., waste, water, materials of concern.)
2. Making sure we are working on the right life cycle stage (e.g., material acquisition, manufacturing, use, end of life)
3. Making sure that we can identify the right actors (e.g. producers, manufactures, suppliers, retailers, customers) to evaluate and implement solutions
4. Informing any implications of trade-offs (e.g., which of the hotspots are more important to work on first and if there may be any burden shifting from one impact to another or one life cycle stage to another …?)
5. Helping to manage limited resources and money (e.g., cannot do everything at once…)

It is not about just identifying the hotspots, but we must also identify the actors who can make changes to address each hotspot at the right life cycle stage – remember our Golden Rule 3 - products/packaging/resources should be managed throughout their entire life cycle.

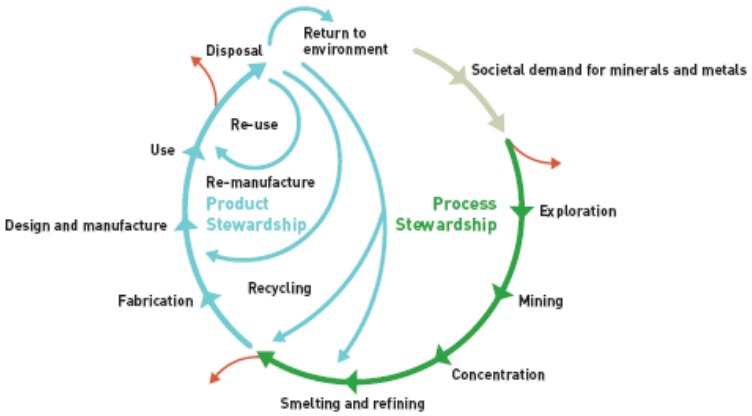

Figure 1. Golden Rule 3 – products/packaging/resources should be managed throughout their entire life cycle – which often extends globally [3].

An example (although dated) is how a beverage company used the results of life cycle information to challenge the materials suppliers to do better. A major beverage company developed life cycle information and found that all the material providers had some type of impacts. They did not ban any materials, or de-selection. They challenged material & container companies to adjust. Aluminum came up with a recycling process for used beverage containers, as a result it helped develop the infrastructure for aluminum recycling and recycling in general. This resulted in 90% life cycle energy reductions when secondary aluminum was used in beverage containers.

This is a good example of recognizing that all materials have impacts and solid collaborative among suppliers and customers to proactively understand the life cycle impacts and hotspots, identify the actors, and then work to come up with solutions which is good for the environment and which creates business value.

1.5. Golden Rule 5 – *LCA information is essential but not sufficient*

Research performed as part of the UNEP/SETAC Life Cycle Initiative found that LCA is important but there was a need to go beyond LCA studies [4]. A methodological framework which developed, and its application illustrated. The framework allows for the rapid assimilation and analysis of a range of information sources, including life cycle based and market information, scientific research, expert opinion, and stakeholder concerns". The latter is what is being called 'life cycle information'. Some differences between the two approaches were noted: Hotspots Analysis (HS A) often includes a broader stakeholder engagement, covered a broader range of impacts, was slightly easier to use, and included both qualitative and quantitively information. It was clear that both have important and valid uses.

An example was highlighted in the UNEP/SETAC hotspot analysis report based upon efforts by the appliance industry (Figure 2). The goal was to develop guidelines based upon life cycle-based hotspots analysis that could be used by the appliance companies to develop the next generation of appliances. The hotspots analysis framework used input from environmental, technical and Corporate Social Responsibility (CSR) considerations, coupled with product life cycle data, scientific studies, standards, stakeholder concerns, feedback from key value chain players, and industry and product experts – clearly LCA data is a critical part of the hotspot analysis but is not the only source of data and information. A systematic process was used to identify the hotspots which together with key product and stakeholders developed a set of targeted that could be used by designers to develop the next generation of appliances – greener than the previous generation. To reach alignment of the criteria, a multi-stakeholder group (SAG) was used early and throughout. The SAG consisted of professionals from NGO, Government, business and technical communities.

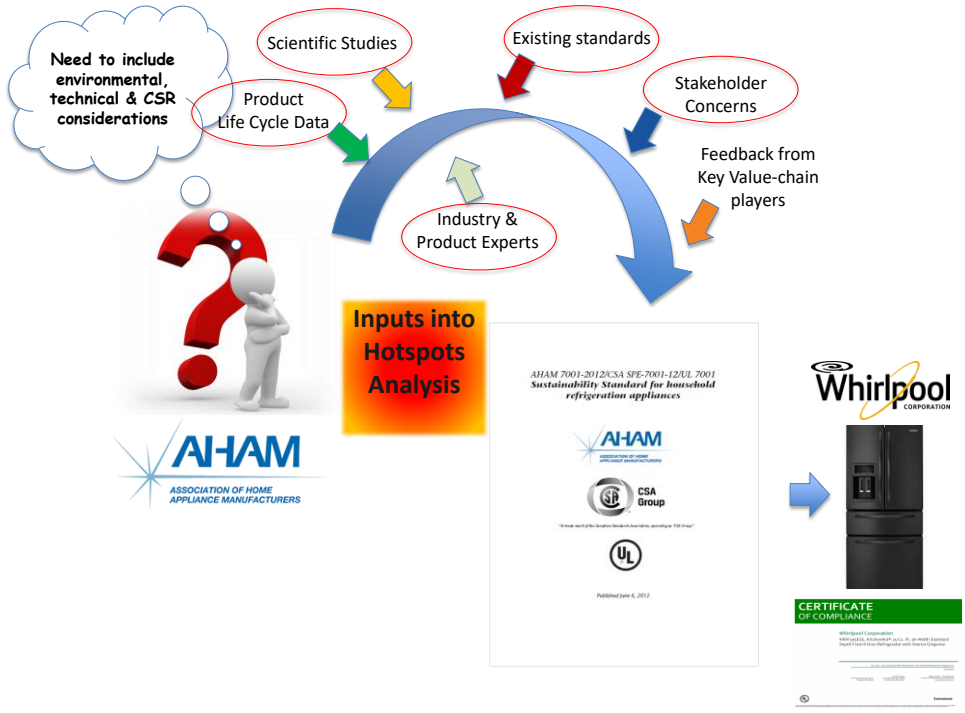

Figure 2. Application of the Hotspot Analysis by the Appliance Sector to develop appliance product sustainability standards [4].

The Task Force considered the science from the LCA and hot spot analyses and balanced these with some of the stakeholder concerns and value judgments from key stakeholders. For their standard effort, they selected these categories of attributes or areas of focus (Figure 3) and weighted the relative importance of these based on the science + value judgement of key stakeholders.

The most significant deviation from the LCA results is that the Energy Consumption during Use attribute is allotted 45% of the weighting within this Standard, compared to the greater than 70% share of life cycle impacts according to the LCA. The Task Force arrived at this value because it represents the largest share of any of the attributes (consistent with the LCA), while taking stakeholder input into account (e.g., importance of materials of concern) and encouraging manufacturers to make improvements in the areas covered by the other attributes. An important conclusion - Hotspot analysis should start with LCA results. It is acceptable and often preferred to go beyond LCA results in the generation of life cycle information to inform decision making. UNEP provides guidance and examples of applying the hotspots analysis methodical framework [4].

1.6. Golden Rule 6 – *If you do not know where you are going, any tool will get you there*

Companies are often developing tools to embed life cycle information into decision making. Occasionally, the work was within a technical group within the company – perhaps the Environmental, Health, and Safety (EHS) department only. A design for environment tool or an LCA tool/study was conducted because the company thought it would help identify impacts of the products. When the tool was developed, or the study completed, since the users of the information, marketing or Research & Development (R&D) were not engaged in the effort, the results were viewed skeptically or fell on deaf ears – wasted efforts. Tools which do have value may lose their potential to be useful within a company if there is not overall strategy and plan within which the tool applies. Thus, Golden rule # 6 – if you do not know where you are going, any tool will get you there.

An analogy is a builder who does not build the house with tools alone, she also builds the house with a design, blueprint for the building – without a blueprint, any tool may be useful – but will not build the house.

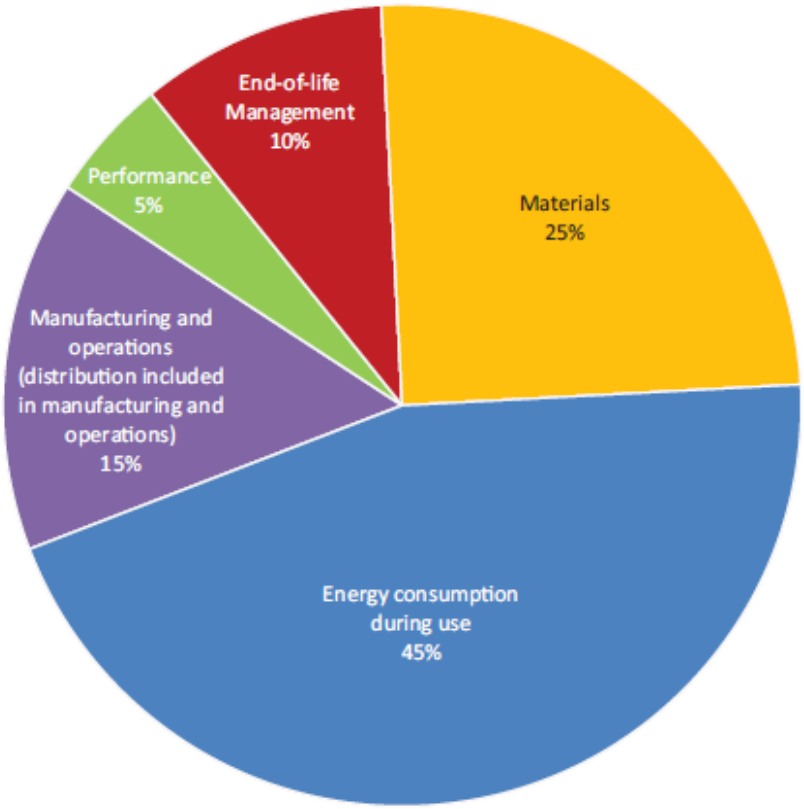

Figure 3. Final attribute categories for the appliance product sustainability standard.

1.7. Golden Rule 7 - *Learn to speak the language of decision makers*

Decision makers are inundated with new and evolving issues, while tool developers & organizations often operate in silos. They often do not talk to each other – or if they do, they sometimes do not use the same language or understand each other. For example – we worked with a computer company who wanted to embed life cycle information into their design process, they moved someone from the sustainability and life cycle team into product innovation. The life cycle person spoke in language of the life cycle community – eutrophication, acid rain, e.g., which the innovation team did not understand. After a time, they made a change and identified someone from innovation who understood the innovation team's processes and language and trained them on the use of life cycle tools and information. It was successful - this person could speak the language of the receiver.

Being able to speak in the language of the receiver is critical and can influence your abilities for them to fully understand and act on your message/request.

A key outcome of several years of working with companies has been very simple 2x2 which we've taken to referring to as our 'Rosetta Stone' because it helps us translate sustainability into the traditional sources of business value – Revenue, Brand, Cost and Risk (Figure 4). This is not to discount the other aspects of sustainability – the environmental and social – but rather we see the opportunity to fully engage businesses on these efforts as the best opportunity to accelerate the needed improvements in the others.

An example was a workshop held in New Zealand; the business value framework was used in a series of interaction sessions with examples. Each attendee going through their own examples and ideas. At the start of the workshop, the attendees were asked to think of a project they had wanted funded within their own company that had not been funded. After the four-hour workshop, the attendees were asked if they applied the language they just learned do they think their project would have been funded – all 40 of them raised their hand and said yes – speak the language of the receiver improves your likelihood for success.

1.8. Golden Rule 8 - *It is all about actions, changing behaviors and business practices.*

To achieve the full benefits of cost savings, improved brand, etc., you need a vision, skills, incentives, resources, and an action plan [6].

1. If you do not have a vision – you get confusion
2. If you do not have skills - you get anxiety
3. If you do not have incentives - you get gradual change
4. If you do not have resources - you get frustration
5. If you do not have action plan - you get false starts
6. All must be in place to achieve change

This illustrates that without all the above elements in place, effective change is difficult to achieve. This is also true for successful innovation programs for sustainability performance. Leading companies have found that a truly comprehensive strategy must further take a life cycle-based approach within these elements of change.

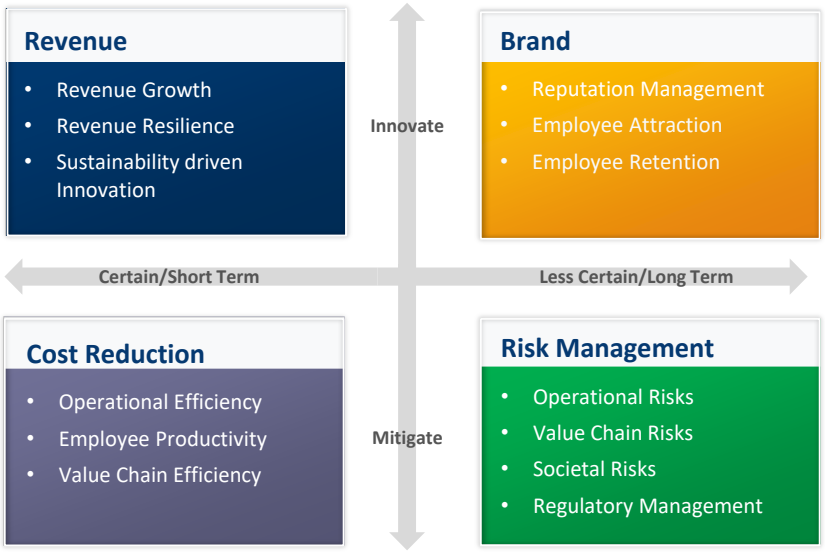

Figure 4. Learn to speak the language of the decision makers [5].

1.9. Golden Rule 9 - *Focus is on positive impacts – not just study results*

To scale and realize the potential business value it is important to consider the steps, resources and associated investments required to be successful. As an example, you can consider an LCA report (Figure 5). If that report is put on a shelf and never used, it's contribution to business value will be minimal; however.

If the same report is used to inform R&D decisions, identifies key risks in the supply chain, is leveraged by the sales team in client engagements and is embedded in the marketing efforts the contributions can be substantial.

1.10. Golden Rule 10 - There is a growing life cycle community – all around the world – they are a resource – access them

There are organizations available to support your efforts to better understand the development and how best to apply lifecycle information. A few of these are:

- SETAC - https://www.setac.org/
- The Life Cycle Initiative – UNEP/SETAC - https://www.lifecycleinitiative.org/
- FSLCI - https://fslci.org/
- Numerous Country LCA networks – e.g., ILCAN (http://www.ilcan.or.id/), ACLCA (https://aclca.org/)
- International Organization for Standardization (ISO) https://www.iso.org/committee/54854.html

Collectively they are an excellent resource to inform and help you understand the what, why and how to accelerate the use of life cycle information into decision making to avoid burden shifting and at the same time to create both business values and help address societal needs.

2. CONCLUSIONS

While understanding the Golden Rules is important, their real value is realized only when they are applied. Review the Rules, talk about them with your colleagues, management, agree on which ones will be an initial focus and apply them. There is no magic order. The success is trying them, learning from successes, and what did not work. Adjust and then try again. The Ten Golden Rule are:

1. All products/packaging have some type of impact – there are no green products/packaging – only 'greener"
2. Products/materials/packaging can have multiple impacts – must understand trade-offs and their implications
3. Products/packaging/resources should be managed throughout their entire life cycle – which often extends globally
4. We must focus and act on the right impacts at the right life cycle stage
5. LCA information is essential but not sufficient
6. If you do not know where you are going, any tool will get you there
7. Learn to speak the language of decision makers
8. It is all about actions, changing behaviors and business practices
9. Focus is on impacts – not just study results
10. There is a growing life cycle community – all around the world – they are a resource - access them

After reading this paper, one should be able to identify several actions that could be taken to create business value through use of life cycle information.

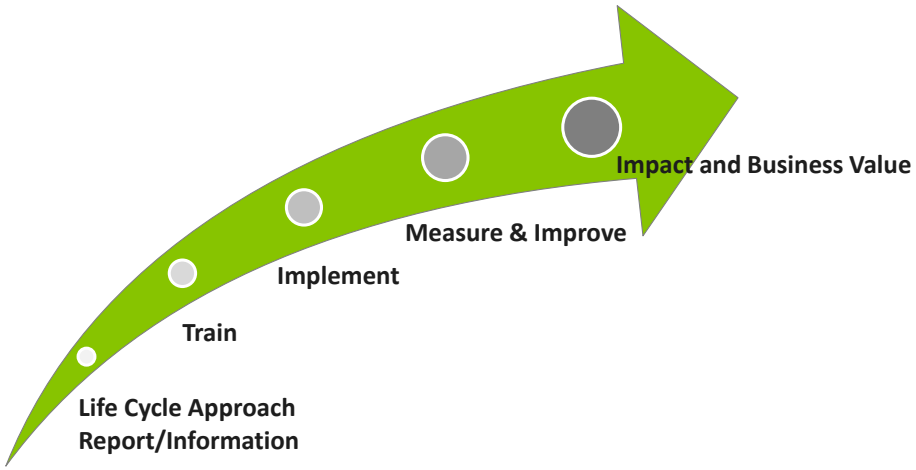

Figure 5. Focus is on impacts – not just study results [7].

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