Jun 17th, 12:00 AM

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# Integrating Sustainability Literacy into Design Education

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**DOI: 10.21606/drs.2016.380**

**Abstract:** A base definition of sustainability is balancing environmental, economic and societal concerns with future generations in mind. At its core, sustainability is future-focused, as the education of future design professionals must be. Design is understood to be a discipline seeking to improve the condition of current and future populations. Why then, is sustainability not universally integrated into design education programs and their curricula? This paper will look at a logical framework for instructors to introduce sustainability into design curriculum in a manner that shifts from looking at sustainability competencies, to a more profession-specific vision for sustainable literacy. An argument for the need, approach and opportunity for sustainability literacy, as well as a case study in which this framework was applied to a graphic design studio class will be shared.

**Keywords**: sustainability literacy, design education, problem solving, design pedagogy

## Introduction

Sustainability is a broad and complex topic. It's an urgent topic that has found its way to the boardrooms of corporations and agendas of world leaders. It is easy to understand how such an intimidating topic might seem overwhelming to introduce into the design classroom. However the need to do so is inarguable, as it becomes a worldwide concern. Preparing designers, who will create structures and design pieces for mass production, to understand and implement sustainability is of vital importance to the health and well being of future populations. This paper proposes using a framework to shift from looking at sustainability competencies to a more profession-specific vision for sustainable literacy.  A first step to establishing literacy for sustainability is to define and communicate what sustainability is. As well as address considerations associated with it, and integrate this understanding as a part of students' problem solving process. In order to accomplish this goal, educators are key to

creating an environment for sustainability to be addressed.  There must be a more vital and direct role for sustainability to be integrated into the classroom and within educational programs. Attending to populations such as education, which has the potential for the most catalytic effect is essential to the goals of sustainability. Teachers, their roles in schools, and society at large can work toward significant change for the better. (Warren et al., 2014) A wide-ranging impact could be achieved through design educators and design programs introducing sustainability to students who will become professionals in industry.

Design Education in particular has the potential to play a powerful role in addressing sustainability. The visual nature of design—with its ability to communicate across cultures and languages—has great potential to communicate and support sustainability worldwide. Design encompasses a board range of distinct disciplines each endeavouring to prepare their students for professional practice using visual methodologies. Specifically, graphic design has the ability to communicate a shared visual language of iconography. Iconography provides a holistic understanding of imagery as a message, which even has the ability to communicate with illiterate populations worldwide. Design educators play an integral role by teaching visual concepts that could contribute to sustainability literacy. The visual dialog provided by design has the potential to create behavioural change and ultimately reach a broader audience of the world population.

In this paper the Sustainability Education Framework of Teachers (SEFT) will be introduced and demonstrated as a pedagogical context for introducing sustainability literacy to graphic design curriculum. While the following case study will demonstrate SEFT within a graphic design studio classroom, it should be understood the power of this structure is its ability to adapt for the application to any curriculum with the focus of a professional degree. The shift of this system's concentration from measuring sustainable competencies, to a focal point on sustainable literacy is adaptable and scalable. This makes SEFT an entry point for instructors who are not experts in sustainability. SEFT focuses on a collection of skills that grow with, and moves the focus of measurable competencies to a future date. This is particularly astute and appropriate to the design education process because time and distance are required for the design knowledge, abilities and behaviours students have learned to become quantifiable. Sustainability should be an integral part of any designer's education, as all design disciplines are focused on becoming future makers and creators with great potential impact on environment, economy and society.

## Sustainability, the United Nations and the Call for Design

The history of sustainability is closely linked with environmentalism and the realization of human impact and detriment to the environment. In the United States, environmental concerns came to the forefront in the 1960s. Since then, many national and international programs have combined environmental responsibility with social concerns, economic growth and business development to look holistically at sustainability.

In 2015 the United Nations formally adopted the Sustainable Development Goals (SDGs), which are intended to give international communication action items to address and solve some of the world's biggest problems by 2030. It is a long list featuring seventeen main goals written in dense language. To truly mobilize people around these goals it will mean communicating this plan succinctly and clearly. It will mean crossing cultural divides and language barriers, and millions of people worldwide who cannot read or write. This is where design, specifically graphic design, can play an important role. The design firm Trollback + Company was hired to brand the United Nation's Sustainable Development Goals. In branding these goals across culture and to populations who cannot read, the firm's charge was in essence to give world literacy to sustainability.

Though he thinks all the goals are important, Jakob Trollback, owner of Trollback + Company, notes:

> "In a way, everything starts with 'Goal 4: Quality Education.' A civilized and human society can only be built with education. It creates insight and empathy to stand in the way of intolerance and abuse. Just look at the systematic way that the Taliban and ISIS are trying to eradicate education, and you understand what's in the balance." Which might be why the U.N. has been so ambitious with one of the targets Goal 4 needs to hit: "By 2030, ensure that all youth and a substantial proportion of adults, both men and women, achieve literacy and numeracy." (Wudel 2015)

The concept of literacy in relation to sustainability is a key and approachable link for design education programs to infuse into their curriculum. While the SDG's Goal 4 refers specifically to reading, writing and numeracy, the idea of literacy is at the core of every curriculum. Design programs already universally translate the idea of literacy into *visual* literacy, ensuring their students are able to accurately write about, discuss and interpret the visuals they see and create. All design programs promote they are moving with the rest of the world toward a future of better understanding of our use of materials, and the impact of our work on the environment and society. This makes it clear that sustainability literacy should be an important part of our design programs and curriculum.

## Sustainability and Education

David Orr makes a clear connection between sustainability and education in his book, *Earth In Mind*. He calls for a rethinking of education to focus on issues of human survival in the 21st century:

> The crisis we face is first and foremost one of mind, perception, and values: hence, it is a challenge to those institutions presuming to shape, minds, perceptions and values. It is an educational challenge. More of the same kind of education can only make things worse. This is not an argument against education but rather an argument for the kind of education that prepares people for lives and livelihoods suited to a planet with a biosphere that operates by the laws of ecology and thermodynamics (Orr 2004)

In *Ecological Literacy: Education and the transition to a postmodern world*, David Orr (1992) distinguishes between technological sustainability and ecological sustainability. The former

is premised on the belief that every problem encountered by humans can be solved through technology and market solutions. However, ecological sustainability relies on the overall moral improvement of society to bring human existence into balance with the rest of nature.

One of the challenges of integrating sustainability into education lies in reaching consensus on a precise meaning for the term. It is complicated by the wide use of *sustainability* and *sustainable* presently enjoyed in the popular media as a marketing tool. Often these uses align with Orr's technological sustainability. Although not necessarily incompatible with the larger ideas associated with sustainability, narrower uses of the term *sustainable* to refer exclusively to environmental impacts, which under represent the broader perspective sustainability entails. (Nolet 2009)

We see this confusion mirrored in the understanding of the students in our college classrooms. Their understanding of sustainability links directly to the narrower use of *sustainable* and environmental impacts, as well as a strong belief in technological sustainability. The computer and the vast technology of software which accompanies it has not only changed the way design and industry produces and practices, it has had a large role in shaping the individuals that now fill the seats of classrooms. The design students of today are from the 'Net' generation (those born between 1977–1999) who have only known a life embedded with technology. The 'Net' generation has had access to super-realistic video games, the Internet, e-mail, instant messaging, online communities, videos, and music that can be downloaded at will. This level of interactive technology is shaping the 'Net' generation's culture, values, and world outlook. (Quam 2013) It is a world-view that typically embraces technology as a solution. These factors create a challenge for educators when introducing sustainability into the classroom and their programs of study.

In their 2014 article "Sustainability Education Framework of Teachers [SEFT]: Developing Sustainability literacy through futures, values, systems and strategic thinking" professors Annie Warren, Leanna M. Archambault, and Rider W. Foley move the typical conversation of sustainable competencies—a wide set of skills, abilities, and behaviours that in theory should be measurable and observable—to focus on sustainability literacy. They argue [sustainability] literacy suggests a collection of skills that, once achieved and formed, can manifest a particular level of competence that can be measured in the future. They use the term literacy as a collection of skills that allow for effective participation and influence in diverse areas of social life. (Warren et al., 2014) This realistic perspective becomes a feasible and approachable way to introduce this large and complex topic to 'Net' generation students.

In the Sustainability Education Framework for Teachers (SEFT) four ways of thinking are posed: systems, values, futures and strategy. This provides a conceptual framework for analysing and considering sustainability problems and solutions through a networked approach. It is through the use of this system that they propose establishing sustainability literacy in the classroom.  SEFT provides the opportunity for self-reflection and independent enquiry by considering and learning through real-life issues. The four lenses may be used in a variety of ways. They require considering critical inquiries related to societal values, equity,

and visions of the future—unpacking the status quo and exploring and articulating pathways towards a sustainable tomorrow. (Warren et al., 2014)

The SEFT framework methodology gives educators a clear understanding of how to evaluate and take action—as citizens and educators—on the following:

- Observed symptoms are the result of cascading effects linked to interconnected *systems* (Meadows, 2008; Warren et al., 2014)
- *Values* connected to over-consumption and inequitable distribution of resources is creating conflict (Ostrom, 1990; Warren et al., 2014)
- Human-caused environmental damage to the biosphere and local ecosystems is threatening the viability of *future* human generations (Rockstrom et al. 2009; Warren et al., 2014); and
- Solutions to sustainability challenges must consider trade-offs and be constructed *strategically* to maximize benefits and ameliorate negative unintended consequences (Costanza, 2011; Gibson, 2006; Warren et al., 2014).

## SEFT Case Study in a Graphic Design Studio Classroom

In considering the Sustainability Education Framework for Teachers (SEFT) in relation to design and design education, immediate connections become evident for the adaptation of it to design programs and curriculum. For sustainability to become effective it is essential for an overall shift in values and perception to occur. Today, we face challenges that literally are planetary in magnitude and complexity, and it is becoming increasingly clear that our thinking is the problem. If we want to change the kind of thinking we are doing, we need to change the educational systems we are using to create that thinking (Orr, 2004; Nolet 2009) This generation entering the workforce has already ushered in unprecedented changes. They are ideal candidates to instigate the change that must occur to establish a long-term, forward-looking perspective with future generations in mind for all that we do and create.

While some design disciplines, such as architecture, efficiently and quickly embraced sustainability and have been able to establish measureable competencies for it within their profession, other design disciplines have struggled to integrate it. When there is a blatant connection in materials use and environmental impact related to a specific profession, an entry point to sustainability becomes evident. In the profession of graphic design this has been the case. Curriculum revolving around green design, espousing the use of recycled paper and soy inks and selecting digital mediums over print—which is not *always* the most environmental solution—has been integrated into many graphic design programs. The environmental consideration of resources and materials—while extremely important—is only one aspect of sustainability, which calls for a more holistic understanding. This is where many design disciplines are challenged and seem to falter when addressing and integrating it into their curriculum and program focus.

With the SEFT framework's perspective moving from evaluating competencies to focus on profession-specific sustainability literacy, a scalable and feasible entry point is created. The

following case study introduces the SEFT framework applied to a graphic design studio class's projects. This is an example of using SEFT to integrate sustainability into a graphic design curriculum with its emphasis on the development of sustainability literacy through futures, values, systems and critical thinking. Authors of the framework stress that while their parameters are presented in a specific order—they should be considered in parallel and are conceptualized as being bi-directional and interconnected. The logical entry point in the framework presented is dependent upon the problem and/or solution being observed. (Warren et al., 2014)

The graphic design profession is currently in an accelerated rate of evolution due to technological development—as are many other professions. The profession as a whole has shifted from a predominantly print-based practice to one whose future is digitally focused with graphic designers functioning in a team-based environment more than ever before. Situated as a visual problem solving profession in the areas of communication; branding; advertising; and information dispersal, graphic designers have long been trained in the forward-looking, systematic and strategic ways of thinking the SEFT framework mentions. The design profession, like many others, inherently has imbedded in its curriculum the conceptual framework for analysing and considering problems and solutions through a networked approach. However, the SEFT framework provides a new approach to problem solving, and furthermore specifically introduces the idea of values thinking into the classroom. This becomes an important part of a student's education. It allows them to develop their individual voice and contribute to society not only on a professional level but as individual citizens as well.

When integrating the SEFT framework into the following classroom projects for this case study, the initial consideration was the subject matter and content for the projects. Carefully considering these foundational aspects for the projects allowed connections of sustainability and a more holistic examination of final solutions. The first project was environmental in subject matter, allowing for a stereotypical understanding of sustainability to be an entry point, while the second project was more open-ended in subject matter to encourage students to broaden and explore their initial understanding of sustainability. The SEFT framework was used as a series of methods—ranging from discussion, to role playing and mapping—to help frame the students' process and solution development. The SEFT framework infused broader reaching considerations and a more holistic perspective when students were developing problem solutions. In the first project junior and senior level graphic design students were challenged to develop a visual campaign that brought awareness to endangered prairie habitat. Prairie was once native and dominated the agriculture-based landscape that today surrounds their university. This class project was titled "The Prairie Project" and will be referred to as such throughout this paper. In the second project the same students were asked to develop communication pieces to address a place, concept or culture they felt was in danger of disappearing within their own and/or future generations. This project was entitled "What's Worth Sustaining?" and will be referred to as such in the ensuing discussion.

Both projects immediately engaged students in values thinking. By using values thinking, graphic design students were able to more accurately address the design problem within a comprehensive context and consider how their solution might communicate more extensively beyond their initially targeted audience.

> To use values thinking involves concepts of justice, equity, social-ecological integrity, and ethics. It also means understanding how these concepts vary across and within cultures, and how integrating these concepts contributes to solving sustainability problems… Another essential element for values thinking is to consider how our current problems and possible solutions impact a variety of different people. Solutions must be fair to concerned stakeholders and should be transparent in order to be equitable. Just as the development of sustainable solutions should involve everyone affected, solutions should not just benefit a single person or group. (Warren et al., 2014)

With the use of values thinking students were able to articulate, consider and work through preconceived notions. For "The Prairie Project" students had to consider two disparate stakeholders: farmers whose agriculture-based livelihoods not only supported the state's main industry but were also responsible for the reduction of the state's prairie habitat, versus those seeking to preserve and restore prairie habitat. Creating a solution that focused or promoted one over the other was understood to not be a thorough and strong solution through the lens of values thinking. This became more evident to students through role-playing in which students took turns playing the roles of agricultural stakeholders and prairie stakeholders. One student whose initial focus was to develop a campaign 'shaming' farmers and the role they had played in the devastation of prairies, evolved into one of educating both sides to move forward with more measured consideration for the future. In the "What's Worth Sustaining?" project students were also encouraged to consider multiple viewpoints, apply a range of values and consider equity and justice in their solutions. For this project several students elected to focus on lifestyles they felt were detrimental to society as a whole. Again, through role-play students were able to look at the possibilities of injecting metaphor and humour into their project to speak to a broader audience and do so in a non-judgemental manner allowing their message to span societal boundaries. In both projects opportunities created through class discussion where students had the opportunity to ask questions, clarify and analyse their values and explore others values in a safe place of small group discussions were key in shaping the students approaches and concepts. Using role-playing, students were able to ask clarifying questions of one another and explore how values operated in a range of contexts. This allowed them to develop a more empathetic approach to a broader range of audiences.

In both projects students were encouraged to consider futures thinking as outlined by the SEFT framework. Futures thinking was involved through the ability to think systematically about the future and future generations. They were told that in the seeking of sustainable solutions:

> Stakeholders, policy makers, innovators, and citizens need consider how past decisions led us to the crisis we face today. We need to anticipate and imagine how today's

> solutions could introduce negative cascading effects and become tomorrow's problems. Likewise we need to work through plausible scenarios of the future that can lead to safer, happier, and healthier futures, and work to achieve these futures today. (Warren et al., 2014)

In the "The Prairie Project," students considered how the single-minded pursuit of growth and industry in their state had caused the destruction of prairies. However, through a balanced, futures thinking approach, they were also able to understand that a single-minded reversal towards conservation and preservation was also not the answer, nor was a 'no-action' scenario acceptable. In the "What's Worth Sustaining?" project students were able to examine a self-selected issue to develop their voice and a better understanding of the culture they operate in as designers. With futures thinking, students began to consider more expansive solutions identifying future trends and taking advantage of or redirecting from them. In several instances futures thinking allowed students to realize their power through design communication to create a future instead of merely accepting how things are. A specific example of futures thinking at work with the "What's Worth Sustaining" project was the selection of one student to focus on her peers as an audience. She built a campaign around the development of two design student personas. One persona was a design student who endeavoured to learn about materials and environmental choices and the other was one whom did not. She used narrative development of these two characters to show a better world when future designers endeavoured to acquire environmental knowledge, and conversely the negative and broad-spread impact of negligence in this area.

Graphic design consistently embraces an understanding of systems thinking in its approach to branding and communications, which spans across time and a range of mediums and avenues to ensure a thorough and cohesive message. The SEFT framework broadens and extends the idea of systems thinking to:

> The ability to collectively analyse complex systems across different domains (society, environment, and economy) and across different scales (local to global), thereby considering cascading effects, inertia, feedback loops, and other systemic features related to sustainability issues and sustainability problem-solving frameworks.(Wiek et al; 2011) Systems thinking does not claim complete knowledge. Rather, systems thinking is about assessing the degree of system complexity and analysing dynamics to make informed decisions that reduce the risk of negative outcomes. (Warren et al., 2014)

In both instances of these projects, systems thinking was one of the more challenging ways of thinking as introduced by the SEFT framework. With the "The Prairie Project" students were able to more easily see levels of connected systems. The relations between human and natural systems were examined as they strove to develop an understanding of their subject matter. Through examining the interconnected nature of the elements, they began to see how a design solution reacting specifically to one aspect of the problem may have unintended consequences. Therefore a majority of their solutions developed into a focus on educating their audience rather than attempting to persuade them. In addressing systems thinking within the "What's Worth Sustaining?" project, frustration reached high levels as

students were not able to collectively map out and recognize patterns. Due to the individual nature of selected topics, they had to construct this understanding independently, which they found to be much more challenging. However, when reminded that systems thinking does not claim complete knowledge, but is rather about assessing and analysing systems dynamics to make informed decisions that reduce the risk of negative outcome, progress was made. (Warren et al., 2014)  Upon reflection, this aspect of the "What's Worth Sustaining?" project might have been aided by asking students to seek out news stories that might identify hidden connections to their topics. This could help them look at possible associations and parallels beyond what they were specifically studying to see unexpected connections potentially leading to unforeseen solutions.

The final way of thinking introduced by the SEFT framework is strategic thinking. Ideas addressing strategic thinking have become essential in graphic design due to the expanded mediums across which communication might take place. Strategic thinking in design means being able to develop a strategy or a plan to achieve a particular vision or goal. This is also the case with sustainability.

> Strategic thinking involves using analogies and qualitative similarities to create new ideas in addition to developing a course of action dependent on new learning (Lawrence, 1999; Warren, Archambault, Foley, 2014). This means finding creative ways to solve the critical problems of our time and understanding and working to reduce inequalities… One stumbling block to strategic thinking is the status quo. The current state tends to exert a lot of influence over future states and can result in path dependency where our current state sets a path for the future. (Warren et al., 2014)

Both projects were effective in building sustainability literacy focused around strategic thinking because both were addressing real-world problems. With projects originating in real-world issues, students were able to engage as productive citizens who have ideas that could be implemented meaningfully and build the necessary knowledge to create meaningful change. In both instances it became relevant and essential for students to identify and question the status quo. This helped shape their discovery and understanding of their projects—specifically in the "What's Worth Sustaining?" project. One area in which design curriculum often falls short in relation to strategic thinking is within testing, evaluating, adaptation and ensuing action plans. Future iterations of SEFT into these design classroom projects should additionally consider these measures in relation to developing strategic thinking.

With the Sustainability Education Framework for Teachers (SEFT) instructors who are not experts in sustainability, but are experts in their profession have a means in which to address and incorporate sustainability thinking into their curriculum and programs. This provides a new framework for problem solving that is more rigorous. A more robust and rigorous problem-solving framework creates professionals who are more agile and ready to face larger, future challenges. The end result is a population of graduates who have the framework and vocabulary of sustainability operating at a professional level in an overall manner that has impact. While this may prove challenging to measure, it is unarguable that

this is an improvement over omitting sustainability in design curriculum, or presenting a narrowed viewpoint of environmental impact. The four lenses require considerable critical thinking related to societal values, equity, and visions of the future; unpacking the status quo; and exploring and articulating pathways toward a sustainable tomorrow. (Warren et al., 2014)

## Future Directions and Limitations

Future pursuit of this research should look at integrating sustainability literacy at the beginning of design students' careers, versus the middle or end, as was done with the juniors and seniors in this case study. Introducing sustainability literacy at the freshman and sophomore levels of a design program allows time for the literacy to become a deep-seated tool in students problem solving. Once this has been accomplished there might be more opportunity to look at measureable competencies in sustainability.

Also, additional future directions for this research should rectify initial limitations of the case study projects. In the "Prairie Project"—which had two key stakeholders, it would have been invaluable for the students engage in discussion with each. While they did engage in role-playing for these stakeholders, participation of the actual stakeholders would provide a more realistic aspect and perspective.

Another potential limitation to this case study is the fact that in both projects, the final solutions were heavily focused on technology and a final artefact. Could more of a focus on the process of problem solving instead of a final artefact be more beneficial to the educational process? This could allow students to focus more on developing sustainability literacy, and could potentially help focus students on a sounder understanding of what David Orr describes as ecological sustainability— rather than technological sustainability. Orr defined technological sustainability as the belief that every problem encountered by humans can be solved through technology and market solutions.

While Sustainability Education Framework for Teachers (SEFT) provides an opportunity for the integration of sustainability into curriculum, it does not consider how to measure its success once integrated. In both of the projects for this case study daily classroom documentation and written student reflections at the end of the project would have provided a greater gauge of the impact of the SEFT Framework, as well as entrance and exit surveys specifically addressing sustainability literacy could be conducted. To further address the value of instilling sustainability literacy into curriculum and its future measurable potential, programs that have integrated SEFT could also survey alumni previous and post integration of the system to measure professional impact.

## Conclusion

While this case study features graphic design for the introduction of SEFT's futures, values systems and strategic thinking into curriculum, one can see how it could be adapted to a range of design disciplines to introduce vital issues to the next generation of decision-

makers. The strength of the framework is that it requires students to consider other people, places, times and spaces beyond themselves—at a time in their lives where there is a strong focus on self. This is especially important to address with college students studying to become professionals whose decisions will affect the creation of plans, places, spaces and products that shape the lives and experiences of many.

Introducing sustainability is not only a responsible action on the behalf of design programs, but an urgent and essential one. Designers make daily decisions with regard to the use of resources, and to the lifestyle and use of products, places and communications. In order to achieve the needs of businesses, the desires of the consumer and improvement of the world, the designer in making decisions must embrace dimensions of social responsibility. However, there is now a need to shift from focusing on a single issue to making a more holistic approach. (Bhamra, Lofthouse 2007) The roles and demands upon designers will also continue to evolve. Graduates with a foundation in sustainability literacy will be equipped to respond to the dynamics of change and the complex and connected global world in which they will operate. The SEFT framework provides the means for instructors from of a range of disciplines and varied levels of experience to incorporate sustainability literacy into their curriculum.

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# Design of resilient consumer products

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**Abstract:** Consumer product sustainability is a topic that has been of increasing interest to practice and academia in recent decades. In this context, a widely discussed means of achieving sustainability is to design more durable products, thereby reducing the need for the production of new products. In particular, the emotional perspective on product durability has received attention in recent design literature, since consumer products are often replaced long before they become physically non-functioning. However, the literature does not provide a full account of the causes of product replacement or of the means for making products more durable. This paper addresses these issues by defining the concept of 'resilient product design', providing a detailed classification of causes of product replacement, and organising means to extend product longevity. Hereby, the paper provides a more structured basis for designers to design resilient consumer products and for researchers to engage in further studies.

**Keywords:** product resilience; emotional durability; sustainability; consumer product design

## 1. Introduction

Given the increasing awareness of the environmental problems we face, sustainability has become a much-debated topic in both practice and academia. One of the means of sustainability that is often mentioned is making products more durable, thereby minimising the need for new products. Since consumer products are often replaced long before they become physically non-functioning, the emotional durability aspect in particular has received increased attention in recent design literature (Cooper, 2004; van Nes and Cramer, 2005; Mugge et al. 2005; Chapman, 2009; Fletcher, 2012). The literature includes several explanations of why well-functioning consumer products are replaced as well as a range of design strategies to increase product longevity. There are, however, still no exhaustive answers to these questions (van Nes and Cramer, 2005; Chapman, 2009).

In relation to the discussion above, this paper argues that there is a need for more complete descriptions of the causes of product replacement and the means of increasing product longevity. This is reflected in existing classifications, which, although they provide good understandings of what the phenomenon concerns, may not have sufficient structure and