DEVELOPING A FRAMEWORK TO MOTIVATE CONSUMERS AND OTHER STAKEHOLDERS INTO BECOMING AGENTS OF SUSTAINABLE DEVELOPMENT

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Abstract: Even though the concepts of sustainable development and sustainability are more than 30 years old, the success of these ideas still lags behind expectations of what promise sustainable futures held for progress by the second decade of the 21st century. Involving consumers in the development of new sustainable products could be the key to the success of sustainability; sustainable brands adding value via engaging consumers in product journeys and leading the way in sustainable education could be the solution. This paper proposes a theoretical and practical framework to facilitate the exchange of such information and improve the interaction between companies, consumers and other stakeholders in matters of sustainability. A model was designed based on a thorough review of the literature and a comparison of propositions on consumer involvement approaches described in detail in the previous work of Moreira et al (2015). From the analysis of 29 different approaches on consumer involvement a new product development framework is proposed, providing indicators for the development of sustainable products and services more likely to succeed in today's competitive market. Finally, to ease the framework's implementation, three activities are proposed for future applications: workshops, an educational programme and an internet based system consolidating the relationship between companies and consumers.
Keywords: Product development; Consumer involvement; Stakeholder participation.

1. INTRODUCTION

In this work, the consumer involvement/engagement in product development was evaluated as the connecting instrument which warrants: (i) the sense of property and prestige in the development; (ii) the constant oriented innovation to their specific requirements; (iii) the guarantee of the efficiency and effectiveness of the new product's development as well as the value perception of its importance towards sustainability; (iv) a feedback tool for data collection

during the use and end-of-life stages, ensuring the product's environmental adequacy throughout its life cycle. Thus, the research presented in this paper focusses on the creation of a practical and holistic framework, in order to ensure social involvement in the development of new sustainable products.

A systematic review of the literature taken from high impact factor journals on consumer involvement in new product development is presented. A framework is then introduced as a way to understand how the best sustainability practices described in the assessed papers translate to a practical environment. Additionally, three possible implementations of the framework are proposed: a) activities such as workshops aimed at raising the consciousness of consumers; b) an educational strategy intended for school students; c) an internet based system, intended as a channel of mediation and communication between the consumer and the industry.

This paper progresses in the following way: a contextualization of the problem is made; followed by a description of the methodology utilised to address this problem; a thorough and systematic review of the literature is described; the proposition of an integrated theoretical framework for the involvement of consumers in the development of new sustainable products and services is put forward; finally there is a discussion on the importance of practical approaches and implementations in order to test the benefits of the proposed framework.

2. CONTEXTUALISATION

Since the first discussions on production limitations due to the growth of the human population in early 70s, researchers have been intrigued by the general conception of 'Sustainability' and 'Sustainable Development' (Barbier, 1987; Basiago, 1995; Harding, 2006; Lélé, 1991; Mitcham, 1995; Robinson, 2004). This questioning is based on the scale of adoption of these concepts as well as the general understandings of 'what sustainability really is'.

Even though the Brundtland report was very broad in its famous statement "Humanity has the ability to make development sustainable to ensure that it meets the needs of the present without

compromising the ability of future generations to meet their own needs" (World Comission on Environment and Development, 1987), it set very specific objectives to be followed: (1) to revive and change the quality of growth; (2) to meet essential needs globally ensuring that resources will be conserved and enhanced, mainly by reorienting technology and managing risks; (3) to consider the tripod between economy, social and environmental development as an international decision making factor; (4) and finally, to consider human factors such as population size and the participation of the system (Lélé, 1991).

Consumers however, seems to be constantly distancing themselves from sustainability goals and instead towards price oriented decisions (Arrigo, 2013; Esbenshade, 2004). Succeeding in developing sustainable products and also satisfying the basic needs of consumers has become one of the biggest barriers in terms of the development of products and services, especially when their sustainable profile does not increase their perceived value (Cracken, 2011; de Medeiros et al., 2014; Van Hemel and Cramer, 2002).

Since the creation of the concept of sustainability, changes in social norms have been influenced by the idea that the protection and preservation of human beings is the main necessity for the success of environmental sustainability (Goodland, 1995). Active and conscious consumer participation then becomes essential as the combination of NGOs, government, businesses and other key institutional actors are not enough, i.e. civil society needs to act too (Robinson, 2004). Harding (2006) has pointed out that sustainable development, as defined by the Brundtland report, actually comprised a series of faults, one of them being its language, as the report does not engage with the public in the way it frames and presents the issue. For Robinson (2004), the scientific and governmental aspects of sustainability are essential in achieving a sustainable society, however, the role of local communities and civil society more broadly needs to be addressed more explicitly and thoughtfully in order to develop a viable sustainability strategy for the future.

In the early 1990's, the idea of sustainability was seen as a cliché – an intellectual oxymoron (Lélé, 1991; Mebratu, 1998), for reasons including the slow pace in adopting sustainable ideals into real action (especially after the USA's refusal to sign and implement the Kyoto Protocol in 1992 which was then renegotiated and abandoned by the country in 2001). Critical analysis of sustainability legislation during this time, such as seen in Dresner's work (2008), point to different interests between the world's southern and northern hemispheres jeopardising the ideal outcomes of several environmental negotiations, eventually leading to incrementalism and limited action and, when considering carbon emissions, to an increase in this problem over the long term (UNEP, 2007).

In the constant quest to create a balance between economic, social and environmental incentives towards sustainability, Riopel et al. (2011) explains that the main focus tends to be on technological development and an organisational change of mentality. However, Barbier (1987) proposed that to guarantee the success of sustainability, it is crucial that the design and implementation of the idea being suggested be tailored to the people who will or should benefit from it.

Within the context of improving consumption patterns and using resources more effectively, research which focussed on product development has been considered crucial (Bhamra et al., 2006; Briceno and Stagl, 2006; Common and Perrings, 1992; Kaulio, 1998; Kim and Damhorst, 1998; Manzini and Vezzoli, 2003; Partidário et al., 2007). The influence and importance of product development and the supply chain of sustainable products has grown considerably since the development of sustainability labels on products such as the "Blaue Engel" or the "Ecolabel"; eventually focussing on complex systems such as Product-Service Systems (PSS) which is built from a socially-entrepreneurial perspective integrating needs and systems (Morelli, 2006) and Cradle-to-cradle which proposes the product is produced and consumed within a self-contained system (Mcdonough and Braungart, 2002).

Based on Sachs' five dimensions of sustainable development: social, economic, ecological, spatial and cultural, the otherwise predominant tripod between social, economic and environmental factors which make up sustainable product development, gain a differentiated and increased depth in terms of the social aspects of sustainability and their influence on the adoption and appreciation of sustainability (Moreira et al., 2017). One example of this shift can be seen in the contemporary predominance of the 'Corporate Social Responsibility' concept, in policy making and corporate PR, and how this trending concept can be used as an organizational strategy (Van Der Heijden et al., 2010).

The need to integrate social concerns into sustainability approaches in order for these to improve is a common argument within the literature (Basiago, 1995; Goodland, 1995; Kang and Wimmer, 2008; Reed, 2008; Sharma and Ruud, 2003; Tang and Bhamra, 2008). The means by which to implement this integration and ensure input from the final consumer from the outset of sustainable development practices tends to be considered by the literature as being a holistic approach. In PSS approaches, the consumer mainly assists in one of the three ways: via a product-oriented approach, a use-oriented strategy or result oriented approach (Tukker, 2003). Ciccanteli and Magidson (1993) propose creating design ideal for consumers and their needs by using classic approaches similar to focus groups, aiming mainly at radical innovation in areas such as retail, banking and healthcare, leading change via consumer feedback and co-creation of products.

Democratizing new product development through consumer involvement is one of the methods found in the literature to increase value creation and to improve consumer's understanding of sustainability (Awa, 2010; Connell, 2011; Niinimäki, 2010; Young et al., 2010). In order to progress sustainability and decrease the communication barrier mentioned by Harding (2006), the literature is divided between: a) understanding *consumer behaviour* (Bertolini and Possamai, 2005; Bhamra et al., 2006; Chan and Wong, 2012; Gam, 2011; Tang and Bhamra, 2008; Young et al., 2010), b) *stakeholder/consumer participation* in product development (Awa, 2010; Ciccantelli

and Magidson, 1993; Kaulio, 1998; Lofthouse and Lilley, 2006; Reed, 2008; Sandmeier, 2003; Weber et al., 2012) and c) *consumer's perceptions* of sustainable products (Connell, 2011; Kang and Wimmer, 2008; Mendolia, 2009; Morais et al., 2011; Niinimäki, 2010; Wever et al., 2008).

Building on the results of Moreira et al. (2015), which analyses the development of sustainable textiles in the aeronautic field, the authors were intrigued about the concern companies had for improving the sustainability of their production cycles, and the simultaneous disengagement of this process from their final consumers. The 'creative consumer'(Blättel-Mink, 2014; Chen, 2011; Cova and Cova, 2009; Horn and Salvendy, 2009), began to be studied at this point as a crucial resource for companies to bring their consumers into the production process, of highly customised products which they could relate and help improve. In this context, Kaulio (1998) identifies three types of design methodology through which various levels of customer involvement can be achieved: 'design for customer', 'design with customer' and 'design by customer' (the last of these the authors represented in Figure 1 by connecting Kaulio's approaches to other authors with similar propositions).

Figure 1: Creative consumer involvement in the development of products

One can see that the consumers' involvement became an important approach to guarantee a new product's success in the market, especially for major industries, eg. automotive. Using the Product-Service Systems (PSS) concept in a 'design WITH the consumer approach', for instance, Dutch companies developed innovative cars using a community as a 'full scale' focus-group, constantly testing and gathering feedback on the development of the product (the car in this case) (Vezzoli and Manzini, 2003). Aiming at a near waste neutral city, Mcdonough and Braungart (2002) have also proposed a cradle-to-cradle approach, in which city inhabitants would be responsible for maintaining the function of this cycle ('design BY the customer'). Consumer involvement is expected in many sustainable product development approaches, such as Life Cycle Assessment, Design for Sustainability, etc. However, avenues to ensure the full participation of customers have not been fully explored by any of the aforementioned methods (Moreira and Wood-Harper, 2015). This paper then, seeks to respond to more universal issues, proposing a framework which can be used to integrate the consumer towards sustainable product development processes, as well as providing resources for its implementation.

3. REVIEW AND ANALYSIS OF THE LITERATURE

The initial scenario overview was carried out aiming to understand if there was a gap in regards to the involvement of the end consumer. It primarily raised seven main focus areas: the generation of less unnecessary residues, environmental innovation, consumer creativity, the use of feedback from current products, consumer's sense of property, prestige sensitivity and value perception of the product (Blättel-Mink, 2014; Chen, 2011; Connell, 2011; Greenfort, 2009; Janssen and Jager, 2002; Rooney, 2007; Sproles, 1981). A total of 944 journals were screened, with 167,295 papers themed around sustainability found from this large sample[1], taken from the

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[1] Accessed throughout November 2015
Elsevier: 156 journals and 47,190 articles
SAGE: 26 journals and 2,616 articles
Springer: 26 journals and 4,698 articles
Wiley-Blackwell: 33 journals and 5,803 articles
Taylor & Francis: 703 journals and 106,988 articles

databases of the five biggest academic publisher's: Elsevier, SAGE, Springer, Wiley-Blackwell and Taylor & Francis.

From these, a list with all the journals, ISSN, impact factor and number of papers was originated and organised in accordance to the impact factor due to its citation importance. On the 10th December 2015, using the keywords: consumer involvement + stakeholder; participation + product; development + sustainability; the authors started to analyse and filter the results, leading to a total of 175 journals, which were then screened for papers. Excluding any result which was not open access or not peer-reviewed (conference and journal papers, as well as, thesis), the initial 1410 links found became 594 manuscripts. They were then screened by title to 140 papers, which were then analysed by their abstracts and their adequacy to the researched topic, finally achieving the manageable number of 32 papers, which can be seen on table 1 classified under the different approaches, main contribution, strengths and literature gaps. These headings are subsequently analysed in the next session.

3.1.   Article's initial Analysis

To provide a broad synthesis of the researched subject, the authors concentrated their efforts on two areas of focus when developing the literature review: the integrative research and the theoretical review. The first presenting the state of knowledge concerning the areas of interest and to highlight important issues that research review has left unresolved, adding or altering the existing body of knowledge (Cooper, 89); and the second providing a general overview of the subject (Knopf, 2006).

Table 1: Articles Analysis

| Reference	Approach	Main contribution	Strengths	Gaps
Alshuwaikhat and Abubakar, 2008	Social Innovation	Practical analysis of the implementation of a 'green' project and its key stakeholders and motivators	Focus on Public participation and social responsibility	No product considerations
Arnold, 2015	Co-creation	Focused on methods such as innovation workshops and idea competition, this article proposes a	Argues on different interactions which could create value	Focuses on how to create value using consumers, not on the products

		combination of relationship management and co-creating as a tool towards sustainability		
Awa et al., 2011	Value Creation	Creation of value through loyalty, once more considering the viability and importance of relationship management	Customer loyalty perspective (sense of property)	Focuses exclusively on value chain
Awa, 2010	Multiple approaches	Proposes the clear understanding of the customer's "voice" in order to avoid failure, also comparing the approaches described before	User involvement as a managerial tool	Very broad
Biswas and Roy, 2015	Value creation	The authors create a scenario in which consumption values are listed and hypothesised	Five kinds of value: functional, social, conditional, environmental and knowledge	Focus on the East and emerging economies
Blättel-Mink, 2014	Active consumership	Provides the definition of prosumer, co-innovator and social innovator	Interesting discussion and provided key stances for this paper	Does not involve the consumer in the development of new products
Bragge et al., 2009	Lead-user involvement	The development of new product using customers who are used to the product and their communities	Direct co-creation from virtual communities	Focused on Information Systems services
Briceno and Stagl, 2006	PSS	The parallel between consumption, social value and human needs	Social value analysis	Does not consider other aspects of product development
Ciccantelli and Magidson, 1993	Consumer idealized design	This paper provides three practical examples of the methodological implementation and comparison with interactive design	One of the pioneer publication on the topic	This method is very similar to focus groups and has strong limitations
Cova and Cova, 2009	Consumer governmentality	Provided the concept of the three faces of the consumer: Individualistic, Hedonistic and Creative	Interesting consumer analysis	Marketing discourse analysis
Gofman et al., 2010	Consumer-driven design	This paper focused on 'rule developing experimentation' in order to assess success	Strong focus on consumer involvement for decision making	Weak bound with product development
Grekova et al., 2015	Stakeholder participation	Quantitative analysis of the involvement of stakeholder, such as consumer and supplier on environmental improvements	Cases involving environmental collaborations between companies, suppliers and consumers	Focus on firm performance
Horn and Salvendy, 2009	Product creativity	Provides an interesting introduction to the seven dimensions of product creativity: Novelty, Resolution, Elaboration and Synthesis, Pleasure, Arousal, Centrality, and Applicability	Interesting analysis on product creativity based on the principle that it increases consumer satisfaction, engagement and acceptance	No focus on actual consumer involvement, just their perceptions
Jaeger-Erben et al., 2015	Social innovation	The authors define five kinds of consumption which can be seem as solution towards sustainable behaviour:	Sustainable consumption practices and means to solve problems related to acceptance, innovation and learning outcomes of	Very broad evaluation of sustainable consumption practices

		community-empowering, competence-expanding, resource-light and waste-avoiding, commonly organised, and need and utility-oriented	sustainable consumption within communities	
Junquera et al., 2012	Client's involvement	Besides pointing out the lack of research on the topic the paper introduces Porter's Hypothesis: based on the idea that regulations instigate innovation and competitiveness	Client involvement in environmental issues in order to improve managerial and organisational performance	Focused on ISO certified companies (strict)
Kang and Wimmer, 2008	PSS	Considering the need for consumer contributions on the PSS this paper analyses the potential for the lack of ownership found in PSS to help with the intensive consumption issue	Analysis of the consumption behaviour and PSS opportunities	Focus on the PSS as a whole not on the consumer
Kaulio, 1998	Customer involvement	Provides definitions and applications to methods such as: QFD, User-oriented and Consumer idealised product development, Concept and Beta testing, User led design	Provides different types of involvement: differentiating design for, with and by the customer	Even though the paper presents a very interesting background to product development it references papers from 1962
Laari et al., 2015	Consumer-driven management	Comparison between environmental and economic factor	Interesting analysis of customer participation in the supply chain (important part of the system)	Green supply chain focus
Lofthouse and Lilley, 2006	Multiple approaches	Very explicit and objective analysis of 10 approaches to involve consumers in the PDP	Inclusive and broad analysis (vide Table 3)	Disregard for other methods which below will be extended into more than 30
Manzini and Vezzoli, 2003	PSS	Practical analysis of PSS as innovation facilitator	End-of-life concern	Focus on PSS
Missimer et al., 2010	Social Innovation	Grounded on a systemic analysis of sustainability the paper analyses success, actions, guidelines and tools to manage, measure and monitor the activities	Framework for strategic sustainable development	Oriented towards systems
Murto et al., 2014	Image boards	Descriptive and practical analysis of image boards also using characteristics from other methods such as PSS	Interesting study from an industry similar to the apparel industry	The involvement is analysed just for initial stages of the product development process
Niinimäki and Hassi, 2011	Multiple approaches	Approaches means to instigate and create deeper connections between product and consumer	Focus on the apparel industry	Does not involve the consumer in the development
Paolocci, 2014a	Collaborative dynamics	Point of view of firms in B2C context, analysing crowdfunding, co-creation, etc.	Quantitative analysis on scientific production	Marketing and innovation focus for managers
Paolocci, 2014b	Consumer engagement	Analyses the idea of consumer participation	Proposes consumer empowerment to create a	Focused on open innovation and web-

		through the concept of empowerment, involvement and interaction	new product and to select and vote for favourites	based engagement and disregards sustainability
Partidário et al., 2007	Stakeholder participation	Proposes solution oriented partnerships between companies, NGOs and the needy	Analyses the use of methods to improve production-consumption value	Based on food production and access
Payne et al., 2009	Co-creation	Customer's shift from passive audience to active player on the creation of value	Provides a model of co-creation using brand relationship and focussing on service and the perception of value	Marketing focus
Reed, 2008	Stakeholder participation	The 'ladder of participation' which provides the typologies of participation from the passive to the most active kind of engagement	Stakeholder participation as key to improve the quality of environmental decisions	The stakeholders here exclude the consumer and focuses on other partners in the development and production
Spangenberg et al., 2010	Design for sustainability	Provides an interesting analysis of eco-efficiency within production and consumption, aiming at understanding the transition towards sustainability and how to find 'true satisfiers' without neglecting needs	Ideal of supply/use efficiency	Focused on design for sustainability
Weber et al., 2012	Customer engagement	Describes the idea of 'prosumer' as a return to the era before the industrial revolution, also considering the importance of customer orientation towards innovation	Interesting analysis on consumer involvement	States the obvious, more of a general review
Wever et al., 2008	User-centred design	Through the concept of sustainable behaviour the authors analyses human-product interactions	Presents diverse design strategies	Focus on end-of-life and energy consumption
Young et al., 2010	Customer engagement	Maps the decision process of self-declared 'green consumers' considering attitudes such as boycotts, positive buying, screening, relationship acquisitions and anti-consumerism	Correlation between consumer awareness and actual consumption	Disregards product development and focusses on acquisitions from people who already believe to be sustainable

From this initial evaluation, the concept of the 'creative consumer' stands out as one which integrates a variety of concepts which would then lead to an appreciation of the value associated to 'green products'. As can be seen in Figure 2, the consumer, characterised by the 'pleasure of the acquisition' and its appreciation, then becomes the binding element to integrate the life cycle management of the product, along with other 'green' development characteristics, connecting the

'voices of the market' to those 'within the enterprise'. The consumer is therefore key to the success of sustainable products and lifecycles.
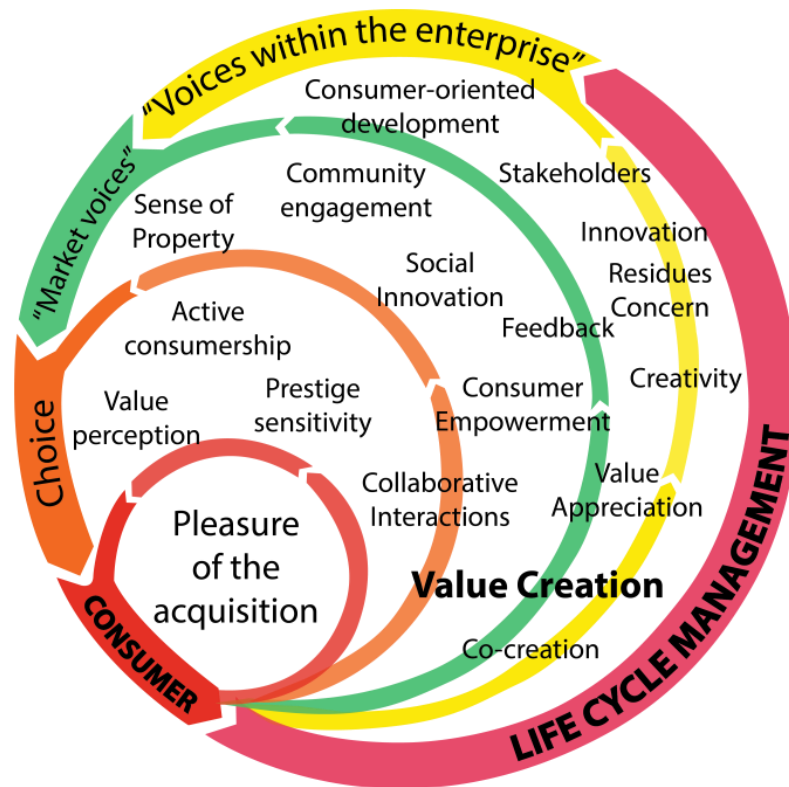
Figure 2: Initial conceptual interpretations of the consumer importance

These characteristics reflect on the perception of value sustainable products have from a consumer's perspective. For instance, by understanding the value of the product, consumers are more likely to be more concerned about the end-of-life process, to provide useful feedback and to incorporate a sense of ownership towards new sustainable product innovations. As has been seen in Table 1, these concepts reflect on the interactions proposed in the literature through aspects such as: the active participation of consumers on the design of new products; socially embracing approaches which reinforce product acceptance; the participation of the numerous stakeholders in holistic approaches throughout the value and supply chains; etc.

3.2. Next step: Analysing the different approaches found

Considering the lack of uniformity of the approaches to integrate the consumer into the development of new products, the importance of comparing them in order to find examples of best practices became clear. Starting from most in-depth article (Lofthouse and Lilley, 2006), which explores 10 different approaches emphasising three main aspects: cost, time and phase of the development to use it. Targeting the fact that Lofthouse and Lilley's initial analysis disregarded weaknesses and strengths of the different approaches, in this paper the authors continued the research by seeking to approach this previous limitation by analysing each approach targeting the opportunity to enable interaction and be integration between approaches, adding new features, trying to derive a single framework. This integrated analysis of the contributions of the authors selected above (Table 1) led to the 29 approaches evaluated on Table 2.

Table 2: Analysis of the approaches

	Approach	Strength	Weakness	Opportunity
1	Active consumership	Consumers actively involved in the process of value creation	Half of the methods used to implement this approach are individualised and not connected to the producer, such as eBay's connection to prosumers	To use the methods of collaboration towards a communication tool between the parties involved
2	Beta testing	Even though this method can be costly, it focus on the actual usage of the product	Applied in the late phases of the development (very common in software engineering)	Such as is done with PSS, this can be a method to collect feedback in earlier stages of the development.
3	Co-creation	The idea of experiencing value	Very intangible concept and exchange of skills	The shift towards being an active player and the possibility of developing the experience further
4	Concept Testing	Conceptual design phase strategy based on a possible prototype	To have a prototype during the conceptual stage of the development might not be an universal option	This would cut costs of later development approaches
5	Collaborative dynamics	Emphasis on the company's need to	Focus on innovation and marketing	Value creation experiments

		constantly absorb and appreciate ideas from actors exterior to them	whereas within PDP innovation is only part of the development process	
6	Consumer-driven design	Consumer insight-driven process	Can rely on 'gut feeling'	Even though this approach can be seen as very culturally bias there are ways to make it more universal
7	Consumer engagement	The intensity of the connection between the company and the consumer	Consumer is seen as a market partner,	Consumer involvement, empowerment and interaction to minimise development risk
8	Consumer governmentality	Consumers who become "agents" of their consumption	This approach is more a matter of power than knowledge/art/design	Empower the consumer without losing the company's identity
9	Consumer idealized design	Current and potential consumers are used together	Can be expensive and follow several stages, requiring several meetings, workshops, etc. Also being based on the creation of a futuristic model	Interesting approach to innovative and ground-breaking developments
10	Creative consumer	Pursuit of pleasure through consumption	Mainly focused on collaborative marketing	Communication, and stimulation using marketing tools
11	Customer diaries	Inexpensive	Requires the consumer to actually keep a diary and use the product daily – without supervision	Close relationship with the consumer and ideally very honest feedback
12	Design for sustainability	Provides 'true satisfiers'	Design focused questioning consumption and production paradigms	Holistic system approach
13	Focus groups	Two way debate	Participants limitations	Explore group identity and investigate conflicting views
14	Image/Mood boards	Visual analysis in the early stages of the development	Might be too broad or require specific skills from the people involved	Time, this approach focuses on ready images
15	Layered games	Interactive and non-explicit method	Requires to understand the nuances of the game	When developed properly can provide non-verbal insights about the product of the participant's mentality
16	Life Cycle Assessment	Based on costs and impacts	Secondary attention to the consumer	Holistic system approach
17	Lead-user involvement	Creative role of a specific category of consumer	Consumers are seen as collaborators of companies so it	Create a mean to incentivize communication

			focuses on current advanced user	between lead users and new user
18	Participant observation, User trial and Product in use	The actual product is once again evaluated by interested consumers during the initial stages of the development	Depends on researcher's interpretations of behaviour	Real- life context
19	Product creativity	Seven dimensions of the development: novelty, resolution, elaboration and synthesis, pleasure, arousal, centrality and applicability	Focus on consumer's judgement – which can be shallow or culturally bias	Explore the other side of consumer involvement and their analysis of the product
20	Product-service system	Incorporation of services into products	Not applicable to every industry	Uses the consumer during varied stages of the development as a sort of confirmation and cancellation system
21	Prosumer	Active consumership (production and consumption in one)	Varies between a sort of self-service and do-it-yourself	The business model as an alternative in the PDP
22	Quality Function Deployment	Approach grounded on Total Quality Management and the "voice of the customer"	Engineering oriented – strict guidelines which might not apply to more creative industries	Focus on assuring that the consumer's needs are what guides the design and production processes
23	Relationship management	Tools to ensure the relationship with the consumer efficiently	No formal framework	Alternatives of implementation already wide spread
24	Scenario-of-use	Manipulating possible scenarios in accordance to the implementation and use plans	Simulating too many scenarios can be costly, yet not sufficiently representative	Character building
25	Social innovation	Analysis developed observing societal behaviour, consumption and interaction	Even though this approach provides a bigger analysis it still disregard cultural dimensions	Community perspective on the PDP
26	Stakeholder participation	Involvement of the supply chain as well as the consumers	Geographic and organisational difficulties	Holistic approach and involvement
27	User-centred design	Focus on the consumer as part of the development	Instead of having the consumer as an actor in the development this approach analyses the consumer 'from a distance'	Facility to ensure the company's identity still considering the human side of the product/service being developed
28	Value Creation	Consumer retention, loyalty and satisfaction	Value is a flexible cultural dimension	Use the consumer as a "solution" part of the development
29	Web of association	Online word association	Superficial analysis	Quick and easy to manage

As presented on Table 2, the 29 identified approaches are mainly tools to guarantee the right course of information between companies and the consumers they want to reach (current, new, adverse, etc). Figure 3, developed from the amalgamation of these approaches which is integrated into a product development framework, proposes the strengthening of the interactions between consumer and company, especially when considering sustainable concerns towards usage and end-of-life (Assunção et al., 2014; Awa et al., 2011b; Huijs, 2009). Organisations are expected to increase supply-use efficiency, guarantee the product's length of life, and create added value through different forms of interaction, service and learning. Concomitantly, the consumer is anticipated to assist in the creation of novel products, diffuse ideas in order to incorporate value and knowledge, and to become part of the production and consumption chain.
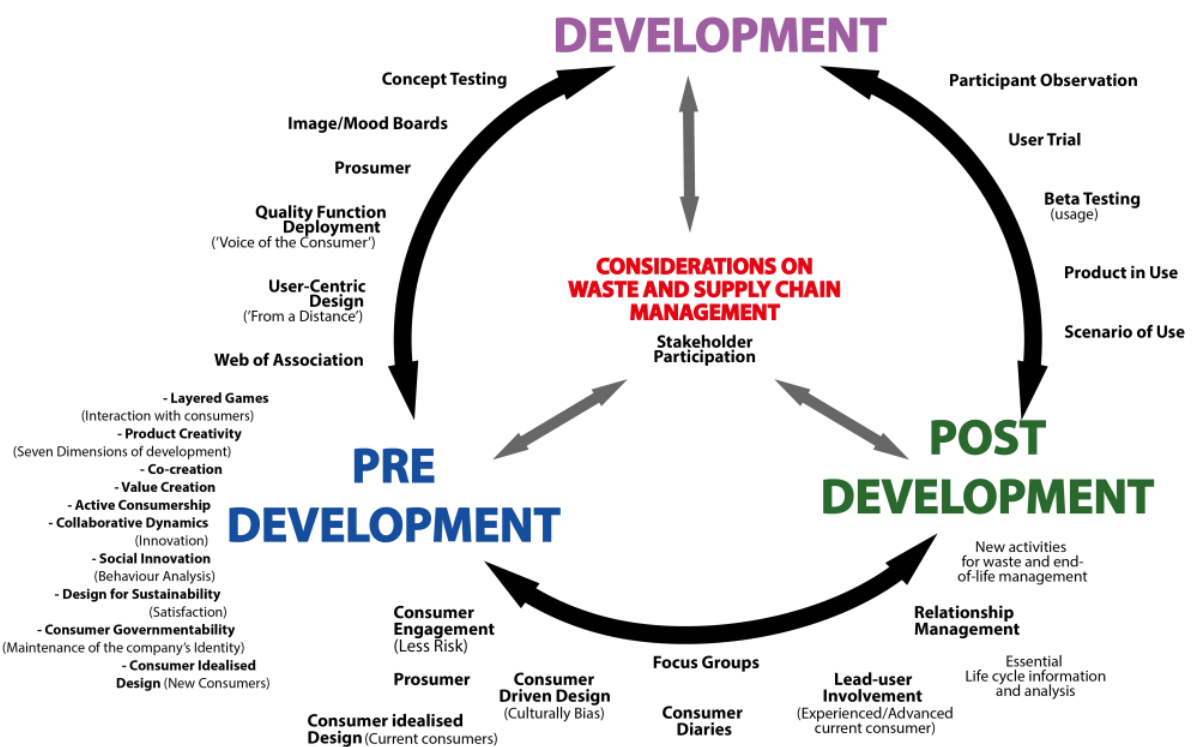
Figure 3: Graphic interaction between the 29 approaches and the Product Development framework

These exchanges would then ensure emotional connection and satisfaction, leading the companies to a successful interaction with the consumer, as well as a higher connection to the final product, enabling environmental practices during the use and disposal/recycling phases of
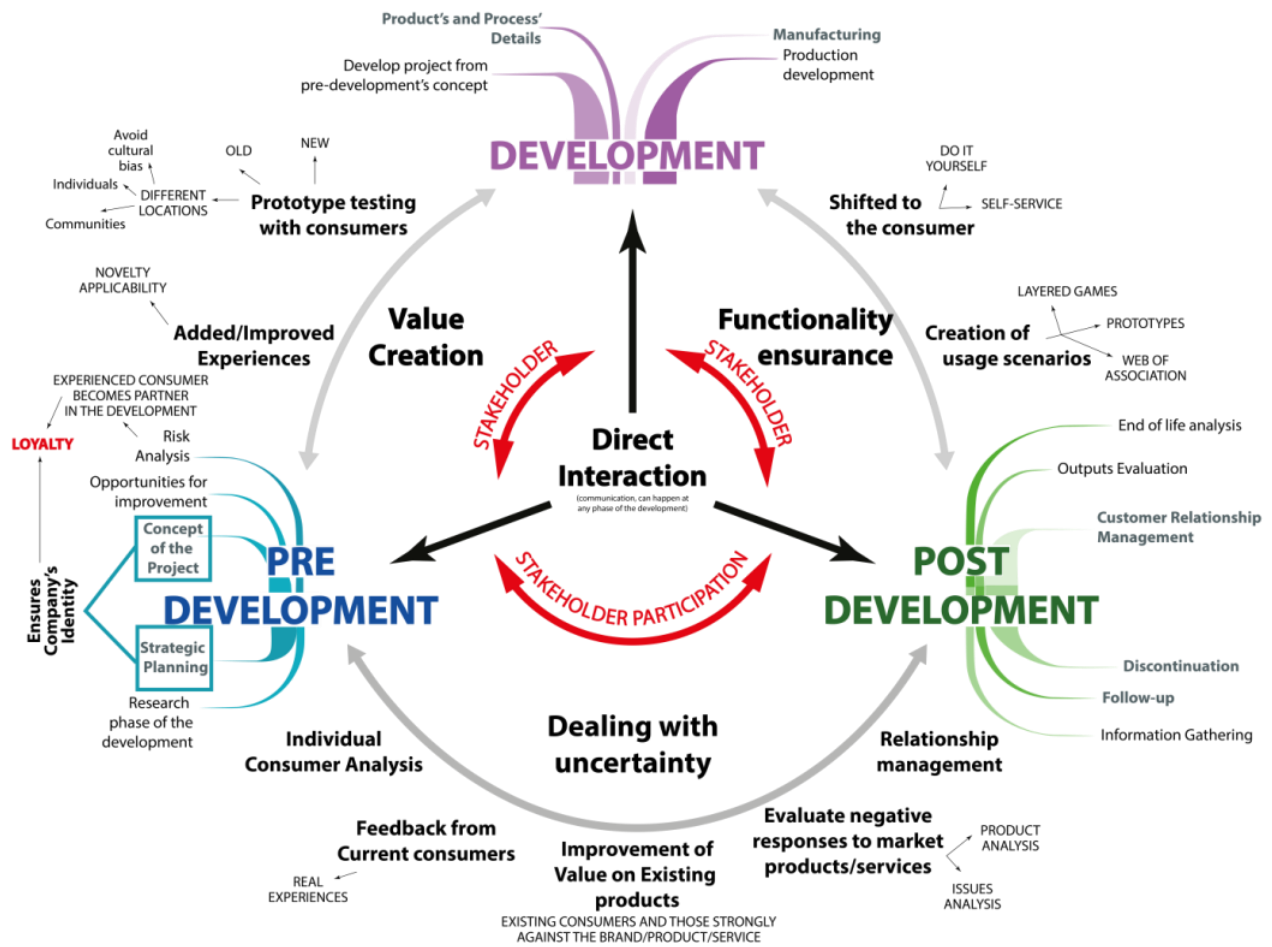
the product. Reaching consumers adverse to the current product would be another outcome of these exchanges, as well as increasing the satisfaction and loyalty of current consumers while still maintaining the company's identity; these were discussed as proposals for incorporations to the three stages of product development: pre-development, development and post-development. Engaging the consumer and ensuring their participation in the process should guarantee their acknowledgement of their importance not only in acquiring the product but also in caring for it and properly disposing of it (Hermans, 2015).

4. FRAMEWORK DEVELOPMENT: IMPLEMENTATION OF CHANGE

In 2015, Moreira et al., proposed a conceptual framework integrating sustainable product development methods into the traditional product development process (Moreira et al., 2015). In the figure, the authors used three different widths of arrows to symbolise the flow of information between the main stages of the development: pre, post and during development; and the key activities to be carried out in each one of the phases.

Once the traditional product development was analysed, along with the consumer involvement approaches, it was possible to create a set of important exchanges for a unified framework (Figure 4). The majority of the approaches involving new and current consumers provide information, improvements and suggestions from the post-development towards the pre-development phases (Arnold, 2015; Bianchi, 1998; Blättel-Mink, 2014; Lofthouse and Lilley, 2006; McAdam and McClelland, 2002; Shen et al., 2010; Ulrich and Eppinger, 1995).

Figure 4: Conceptual framework for the development of sustainable products involving the consumer and other stakeholders

Focussing on relationship management in terms of reaching consumers adverse to the current product, and on the satisfaction and loyalty of current consumers while still maintaining the company's identity, several of the methods are incorporated into the pre-development stage: creating milestones to the creation of perceived value and behavioural consumption (which ideally will not be influenced by regional biases). Engaging the consumer and ensuring their participation in the process guarantees the acknowledgement of their importance not only in acquiring the product but also in caring for it and properly disposing of it (Hermans, 2015).

Once consumers become interested in the development of the product/service, considerations regarding waste and supply chain management expand into a concern for all the stakeholders which then are compelled to participate in all three stages of product development. This shift is

expected to eventually lead to governmental pressure towards social and environmental improvements throughout the supply chain.

Within the development stage, methods tended to focus on either shifting the construction process to the consumer or in evaluating how they would behave towards its use (layered games, prototypes, web of association). Unlike the relationship between post and pre developments, activities carried out between development and post development have the highest cost within the product/service development process (Costanza and Patten, 1995). Overall, the conceptual framework provided on Figure 4 represents all these considerations; activities and important interactions between three key agents of sustainable change within the product development cycle: end-consumers, company development and their suppliers.

5. DISCUSSION AND FINAL REMARKS

Sustainable considerations within the development of new products and services have been the topic of research for over 100 years. Despite a considerable increase in measures to increase sustainability having been developed throughout this period, the goal to find and achieve holistic sustainable practices and products continues to allude companies to the present day. Several procedures and protocols have been implemented by governments to help this quest, however, in terms of hard statistics, the world's environmental decay continues to accelerate.

This paper was developed as a methodological proposition of how to include the consumer in the development of new products and services with the intention of increasing their participation in the process of sustainable development. Several countries have regulations and reinforced surveillance placed in their territories to inhibit the local carbon footprint and to gain carbon credits. Other countries tend to abstain from joining environmental agreements and continue to continue with behaviours that exploit the environment and natural resources.

Effective consumer engagement results in there being another pressure group to demand sustainable development locally and globally due to a simple premise: if every country is given

the same opportunities and receives praise for improved actions, global levels of pollution, waste, unfair labour, etc. will decrease and ideally, a global community built on common values for a sustainable future will develop (as can be seen on the Kyoto Protocol which provides newly developed countries with easier guidelines to follow in order to reduce emissions).

Following the conceptual framework proposed in the previous section, the authors have identified the importance of developing practical means to implement this framework in order to successfully engage current consumers, test the framework's benefits, as well as assess the benefit to future generations. As seen in Figure 5, the implementation can be done at individual level as well as for industry and educational systems supported by national governments.
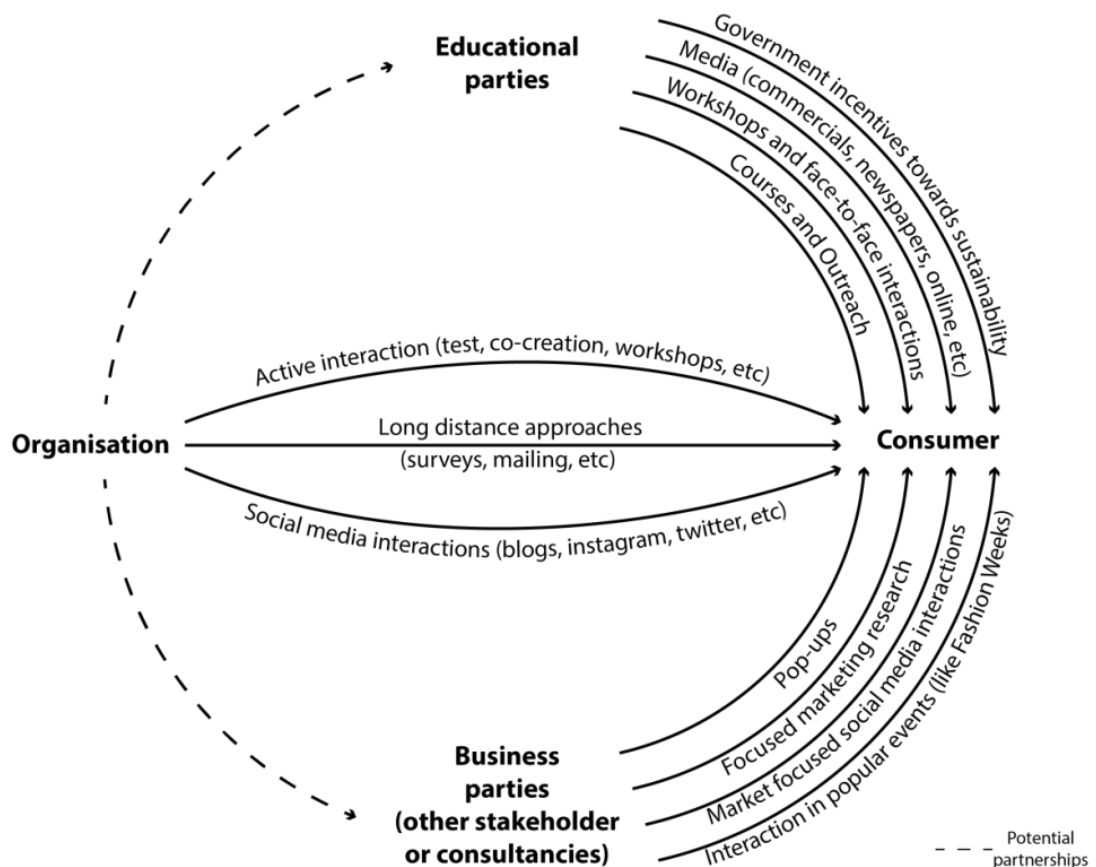
Figure 5: Possible means to implement the framework

The implementation framework proposes a wide range of activities which can be used to incorporate the consumer in the development of new products. However, due to the number of

possibilities, from pop up shops to different media and face-to-face interactions, the practical framework has expanded these interactions, providing them three different focuses: the consumer, educational strategies, and business interests, along with wider stakeholders through a holistic approach.

As can be seen, the implementation of the theoretical framework can happen via three different practical methods:

1. **Organisation and Business partners to consumers**

   o *Awareness workshops* (Moreira et al., 2016): a holistic group activity developed to discuss, with current consumers, their perceptions on sustainability. The concept of awareness starts in the selection of the participants which volunteer to be part of the workshop due to a personal interest on the research banners. Within groups of two to seven people, the participants are invited to discuss each individual understanding of sustainability and daily concepts, evolving into the consumer's perception of their importance on improving global issues such as labour exploitation, human trafficking, and forest decline.

2. **Business and Stakeholders to future consumers**

   o *Educational programme*: proposed to educate students above the age of 10, this method is being developed in the University of Manchester as an academic-organisational partnership[2] in order to start explaining to future generations of consumers the importance of sustainability and sustainable behaviour. The programme proposes an interactive scenario developed around games, quizzes and other activities which would educate children while still being appropriate

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[2] Mainly: STEM - Science, Technology, Engineering and Mathematics Network (http://www.stemnet.org.uk/); RISC – Reading International Solidarity Centre (http://risc.org.uk/), CORE – Creative Outreach for Resource Efficiency (http://www.core-community.net/), and the University of Manchester Outreach through the School-University Partnership Initiative (http://www.supi.manchester.ac.uk/).

and engaging to the student's age group (this initiative is being developed with the assistance of college students from the Nuffield Summer Placement Programme in the UK);

3. And finally, **Holistic involvement (direct exchange and interaction)**

   o An internet based system for all the stakeholders: this last proposition is being developed as an attempt to enable communication between every stakeholder, acting as a means of bringing the learning from the other aspects of this programme together as well as sharing ideas for improving incentives for diverse stakeholder groups to engage in sustainable practices in a committed way.

As part of a PhD research project, the first and second methods described above are currently being developed, implemented and published in the United Kingdom, serving as an initial platform for the distribution and implementation of such methods in other countries, adapting some of the material to cultural specificities in national and local contexts. As for the third method, the results of a longitudinal action case study with three sustainable fashion companies have been informing the researchers on workable solutions for its development, and in helping to attract more like-minded stakeholders, such as for instance the Fair Trade Movement.

By implementing the workshops and classes, the researchers believe that not only will consumers be more involved in the development of new sustainable products, but that companies and other organisations will also be able to increase their understanding of which communication methods work in reaching consumers, and enable organisations to reduce barriers to sustainable behaviour or purchases perceived by the consumer. Moreira et al's working hypothesis is that as soon as consumers and students understand: (1) the concept of sustainability; (2) the importance of their participation towards the expansion of sustainably aware behaviour; and (3) are willing to pass it on to others or actively start discussions on the topic, sustainable behaviour will eventually spread. From the moment sustainability is deemed more important within different

economic scenarios, communities, and industrial sectors, social pressure will then encourage stronger measures towards a global change in behaviours and norms. The model advocated for in this paper should enable this process to be accelerated.

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