A DESIGNER'S ROLE IN SUSTAINABILITY THE EXTENT TO WHICH PRODUCT AND PROCESS DESIGNERS CAN PLAY A ROLE IN ENVIRONMENTAL SUSTAINABILITY AND SOCIAL RESPONSIBILITY

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1.0. INTRODUCTION

In his article for the Journal of Sustainable Development, Olaf Diegel states "designers have a moral and ethical obligation to be responsible for their designs and the impacts of their work (Diegel 2010)." Designers have the opportunity to infuse sustainability concepts into our lives through the products they design. Product and process design is one of ten professional functions surveyed regarding the roles and responsibilities to be held by each function in an organization aiming to increase their environmental sustainability and social responsibility efforts. The following is an explanation of those survey results, how the survey relates to the product and process design function, and the action items the product and process design function identified as areas in which to take a role. These survey results will then be compared to existing literature to determine how well the results correlate to current industry activity.

2.0. METHODOLOGY

Members of ten professional functions were surveyed with respect to the role they could play if their organization decided to move toward sustainability. The surveyed functions include Process/Product Design, Legal, Health and Safety, Purchasing, Manufacturing, Operations, Facilities, Marketing and Human Resources. The respondents were asked to consider their own role within their organization if it were to move toward becoming more environmentally sustainable and socially responsible. Questions were developed to assess each functions role in 35 action items developed from the 220 action items identified in the draft ISO 26000 Social Responsibility Standard (Draft ISO 26000 WD4.2 2008) (Morelli, 2012). The action items were developed around six categories including labor practices, the environment, community development and involvement, organizational governance, fair operating practices, and consumer issues. The respondents were asked to identify what role/responsibility their profession function would take for each item. The response choices included Major Role or Responsibility, Supporting Role or Responsibility, and Minor Role or Responsibility. The authors made distinctions on what percentage of responses indicating a "principal," "supporting" and "minor" role or responsibility would be significant. In this analysis, the function was considered to have identified a significant role if 50% or more of the respondents indicated a major, supporting, or minor role.

The survey was sent to 18,660 contacts provided by Pinpoint Technologies, a direct marketing mail list provider, randomly selected from its contacts database. Approximately 1,663 of the contacts were identified as having being a part of the product and process design profession; 123 of the respondents

indicated the same, indicating a 7.4% response rate for the group. The data is reported at 95% confidence with 9.6% precision (Morelli, 2012).

3.0. SURVEY FINDINGS

3.1. MAJOR ROLE

Members of the product and process design function did not self-report holding the major role for any action item in any core area.

3.2. SUPPORTING ROLE

The product and process design function self-reported taking a supporting role in six action items within the labor practices, environment, and consumer issues core areas. The table below displays these items, as well as the response rate from the product and process function and potential collaborators with their corresponding response rates.

CORE AREA	SUBCATEGORY	ACTION ITEM (#)	% OF FUNCTION REPORTING ROLE	COLLABORATORS (Major Role)
Labor Practices	Human Development and Training in the Workplace	 Provide all workers at all stages of their work experience with access to skills development, training, and opportunities for career advancement. 	57.10%	Human Resources Operations
	Health and Safety at Work	12. Apply principles of health and safety management and provide health and safety protection for all workers.	52.90%	Health and Safety Human Resources Operations Environmental
		13. Analyze, control and communicate the health and safety risks involved in the organizations' activities and ensure that all workers follow safe practices and procedures.	50.60%	Health and Safety Human Resources Operations Environmental
The Environment	Prevention of Pollution	15. Implement measures to minimize waste, prevent pollution and properly manage that which is unavoidable.	51.10%	Health and Safety Facilities Operations Environmental
	Climate Change Mitigation and Adaptation	 Consider environmentally and socially responsible performance when evaluating and selecting suppliers and contractors. 	50.00%	Purchasing Environmental
Consumer Issues	Fair Marketing	23. Ensure the organization does not engage in any deceptive, misleading, fraudulent or unfair practices, including omission of critical information.	50.00%	Operations

Table 1 - Action Items Self-Reported by Product and Process Designers as Supporting Role

3.3. INVOLVED ROLE

In eight instances, the sum of the product and process design function identifying a major or supporting role exceeded 50%. Although the product and process design function did not agree on the role to be taken, it is significant that the majority did report that the function should take a role. The table below displays these action items, the response rates from the function (sum of principal and supporting roles) and potential collaborators.

Table 2 - Action Items Self-Reported by Product and Process Designers as Involved Role

CORE AREA	SUBCATEGORY	ACTION ITEM (#)	% OF FUNCTION REPORTING ROLE	COLLABORATORS (Major Role)
Organizational Governance	General Expectations	1. Ensure the organization is governed in a manner that balanced the needs of the organization and its stakeholders, including immediate needs and those of future generations.	55.70%	Operations
Labor Practices	Conditions of Work and Social Protection	 Ensure that the conditions of work comply with national laws and regulations and are consistent with relevant international labor standards. 	52.70%	Human Resources
Fair Operating Practices	Promoting Social Responsibility in the Sphere of Influence	11. Ensure the organization participates in raising the environmental and social responsibility awareness of those with which it has relationships.	56.80%	Human Resources Purchasing
The Environment	Prevention of Pollution	14. Ensuring the organization measures, records, and publicly discloses the amounts and types of toxic and hazardous materials used/released.	55.80%	Health and Safety
	Climate Change Mitigation and Adaptation	17. Identify potentially adverse impacts on ecosystems and biodiversity and implanting planning, design, and operating practices to eliminate or minimize them.	52.90%	Operations
Consumer Issues	Protecting Consumers' Health and Safety	24. Ensure the organization provides products and services that, under normal and reasonable foreseeable conditions of use, are safe for the users and other persons, their property, and the environment.	78.40%	Operations
		25. Instruct consumers in the proper use of products and conveying appropriate safety information.	67.80%	Marketing
Community Development and Involvement	Wealth and Income Creation	33. Give preference to local suppliers of products and services and contributing to local supplier development where possible and practicable.	66.40%	Purchasing

3.4. COLLABORATORS

The product and process function will likely be working in conjunction with other functions in regard to all action items shown in Tables 1 and 2. Since the product and process design function reported a supporting or involved role for all items, the extent of their responsibilities may vary among organizations, but they have consensus regarding which action items they would concern themselves with. Multidisciplinary teams are vital in a true sustainable effort due to the variety of topics and scopes that require consideration. The product and process design function would work within such a multidisciplinary team, providing their design expertise to those functions identifying a major role. The expertise of product and process designers will be applicable and helpful across the categories covered in this survey.

4.0. COMPARISION WITH LITERATURE

4.1. LABOR PRACTICES

The product and process design function identified action items in the human development and training in the workplace and health and safety at work subcategories as items in which to take a supporting role. The action items (Action Item #7,12,13) discuss the need to provide workers with professional development opportunities and health and safety protection and training. The product and process design function also identifies involvement in the conditions of work and social protection subcategory (Action Item #5). While the product and process design function supports these items, potentially by providing training and supporting other organization activities, the major responsibility for their implementation and success is held by a different function.

4.2. THE ENVIRONMENT

The product and process design function also recognized the pollution prevention subcategory as an area to play a role. A supporting role was identified by the product and process design function in providing an organization with a means to minimize waste and prevent pollution (Action Item # 15). Through the design process, an organization has the opportunity to investigate design alternatives and to minimize environmental, social, economic impacts of their product (McElhaney, 2012). Implementation of a variety of tools can help achieve their sustainability and social responsibility goals.

Software has been created that allows design teams to estimate the EHS impacts of their design (PR Newswire, 2008). Autodesk has developed software that allows a team to quantitatively estimate a product's environmental impact early in the conceptual development stages, so adjustments can be made before time and resources are committed to the product (PR Newswire, 2008). Software like this allows teams to make such calculations without professional consult, speeding up the design process.

A closer look at DfE indicates the potential in using this process to achieve waste minimization and pollution prevention. DfE provides a process for assessing how a product will interact with the environment and consumers (Lewis, 2001). The premise of the process is the use of "detailed checklists that have questions to aid hardware developers in considering DfE principles during design (Donnelly, 2007)." These checklists cover concepts and concerns of the organization such as regulatory requirements, stakeholder concerns, material selection, and end-of-life (Donnelly, 2007). Checklists can be written by multidisciplinary teams and approved by upper management to ensure all company concerns are included, providing designers with the means to consider sustainability concerns without have to become experts themselves (McElhaney, 2007). It is more efficient and effective to make these sustainability considerations early in the design process as opposed to correcting issues after the fact. As stated by Helen Lewis in <u>Design + Environment</u>, "it is at the product planning and design state that waste avoidance, source reduction, water conservation, and energy efficiency can be locked into products, services, and buildings (Lewis 2001)."

Another action item identified within this subcategory discusses the need to measure, record, and report use of hazardous and toxic materials (Action Item # 14). When following DfE principles, designers can look for alternative materials where possible and otherwise ensure proper submittal of material use to those in a principal role so they can be reported properly. The product and process design function has identified an involved role as they will not be reporting this information themselves.

To prevent wasting at the end of a product's useful life, the function may consider the principle Design for Disassembly. The Design for Disassembly (DfD) Guidelines compiled by Active Disassembly Research identifies DfD as an essential technique for designing with sustainability in mind (BSR, 2005). The guidelines define DfD as "designing a product to be disassembled for easier maintenance, repair, recovery and reuse of components/ materials (BSR, 2005)." The guidelines also identify the main considerations in such design as selection and use of materials, design components, and selection and use of fasteners. Through design for disassembly, an organization will be able to reduce waste production and production costs (BSR, 2005).

A review of the EHS performance of Xerox demonstrates the successes that can be achieved in striving toward sustainability within product design and processing. The BSR Sustainable Design report discusses that while a number of methods of incorporating sustainability into design have been identified, the changes needed to implement these methods have not been as thoroughly discussed (BSR, 2008). Xerox, having successfully incorporated environmental product design, remanufacturing, and recycling throughout the organization, has been an industry leader in sustainable design. Highlights of their success include the prevention of over 150 million pounds of waste from entering landfills through equipment remanufacture and parts reuse, achieving a recycling rate of 88% of non-hazardous solid waste worldwide, and the distribution of a new set of EHS requirements to Xerox suppliers in effort to extend their goals throughout the supply chain (Business Wire, 1998).

DfE applies to the action items identified in the subcategory climate change mitigation and adaptation. The product and process design function reported an involved role in identifying and minimizing potentially adverse impacts on the environment (Action Item # 17). When designers are provided with the necessary tools and knowledge, they can adjust product and process designs to minimize the impacts through material selection. DfE checklists, and other processes to be discussed such as product safety management and life cycle assessment. In the article Designing for Sustainability, McElhaney identifies a potential roadblock for designers: while they might need to increase their understanding of sustainability, they lack the billable hours to do so (McElhaney 2007). DfE checklists can mitigate this issue as they provide designers with elements created by a multidisciplinary team that is well versed in sustainability. DfE checklists essentially provide the design team with sustainability considerations that they can influence. The product and process design function identified a supporting role in considering of the environmental and social responsibility performance of suppliers and contractors (Action Item # 19). To the extent that a given organization gives control of selection to the design team, designers consider material availability, where materials originate, and perhaps any environmental management system or certification the company may have. For example, AT&T has a code of conduct for its suppliers that outlines practices that will be considered for all suppliers covering topics such as sustainable business practice, EHS, supplier diversity, ethics, and labor rights (AT&T, 2012). Design teams may not always have such control, which speaks to their identification as a supporting function.

4.3. COMMUNITY INVOLVEMENT AND DEVELOPMENT

The product and process design function identified an involved role within the wealth and income creation subcategory in giving preference to local suppliers when possible (Action Item # 33). Design teams must consider material availability and can work local suppliers into their plans when possible. Such selections may not always be within a design team's control, hence confirming their involved role.

4.4. ORGANIZATIONAL GOVERNANCE

The product and process design function identified an involved role in ensuring that the organization balances the needs of the organization and its stakeholders, considering both immediate needs and those of future generations (Action Item # 1). The article, *A Product-Based Environmental Management System*, suggests that sustainability has traditionally been an EHS and organizational objective; to move beyond the minimum requirements would be the responsibility of upper management and EHS staff alone (Donnelly, 2007). Alternatively, the author suggests that design and development groups specifically should be involved in sustainable initiatives. The design team can employ several methods to improve upon the sustainability factors of products and processes including DfE, life cycle assessment (LCA), product-based management systems (PBEMS), and ISO 14062- Integrating Environmental Aspects into Product Design and Development. Management must enact these choices, but the design team will allow them to prosper.

One way the product and process design function can play a role in meeting this action items' objectives is through the use of LCA, a method for "identifying the significant environmental aspects" of a product or process (Donnelly 2007). The LCA process considers the product throughout its life cycle from design through disposal and allows the design team to consider the impact of materials and any processes involved in development. LCA locates these issues allowing the team to focus on areas for improvement.

PMEMS "addresses the impacts hardware products have on the environment (Donnelly 2007)." Similarly to LCA, PBEMS looks beyond the impacts of manufacturing to include the design phase, use by the consumer, and product disposal (Donnelly 2007). In using a PBEMS, an organization can consider its key sustainability drivers in direct relation to its product drivers (Donnelly 2007). PBEMS is founded on DfE principles and may even include LCA as an element of the system.

ISO14062- Integrating Environmental Aspects into Product Design and Development, a section of ISO14000- Environmental Management, integrates environmental aspects into product design and development by providing a procedure for sustainable product design. It outlines the procedure as: planning (appointing an eco-design team and defining targets), conceptual design (task formulation, developing and selecting eco design concept), detailed design, tests/prototype, production/launching on market, and product revision (Lewandowska 2010). The procedure outlined in ISO 14062 can be implemented within a PBEMS as a basis for considering sustainability aspects. Organization leaders must choose to implement a PBEMS, but in doing so, they are passing the responsibility of designing for sustainability to the design team, who will make these considerations on behalf of the company. As such, it is appropriate that the function identified an involved role.

4.5. FAIR OPERATING PRACTICES

The product and process design function identified an involved role in increasing environmental and social responsibility awareness of those with which a company has a relationship under the subcategory, promoting social responsibility in the sphere of influence (Action Item # 11). By having requirements for suppliers and contractors to meet, the organization forces them to consider their environmental and social implications. As the design team may not always have total control in selecting materials, their role here is supportive. Consumers can also be educated in the products environmental and social implications, but the level of control the design function has over packaging may also be variable, hence the involved role.

4.6. CONSUMER ISSUES

Within the fair marketing subcategory, the product and process design function identified a supporting role in ensuring the organization does not engage in deceptive or misleading practices including omission of critical information (Action Item # 23). Product and process designers must ensure that those who have identified a major role are provided with accurate information about the composition and functioning of the product or process, but the publication of such material is likely controlled by another function.

Under the subcategory, protecting consumer health and safety, the product and process design function identified an involved role in ensuring products and services are safe for users, their property, and the environment and instructing consumers in the proper use of products and conveying safety information (Action Item #24,25). In an effort to provide products and services that are safe for users, their property, and the environment, an organization must consider a product safety program. Product safety program tasking during the concept/design phase, as discussed in Willie Hammer's <u>Product Safety Management</u> and Engineering, include the review of similar products for safety considerations, determination of past problems and potential hazards to users/employees, reviewing and incorporating existing standards, implementing safety testing for materials and components, the establishment of safety and reliability requirements for subcontractors/vendors, and estimating costs of the safety program (Hammer 1993).

Hammer argues that design engineers are responsible for designing safe products. The steps that they must consider include reviewing and observing safety criteria, evaluating the product and its components for hazards and establishing design or procedure safeguards for their elimination/control, insuring information related to safety is provided in manufacturing drawings and specifications identifying safety devices and equipment that should be used with the product, and identifying the means of verifying that safety features and devices will operate as intended (Hammer 1993).

An organization hopes to provide safe products and services under normal and reasonably foreseeable conditions of use by following product safety procedures. The product and process design function take an involved role as management must ensure policy dictating product safety has been initiated and that responsibilities for implementing and coordinating the program have been assigned (Hammer 1993).

The product and process design function identified an involved role in conveying safety information to consumers. Designers must ensure that information regarding a product's safety performance is provided the function in the major role, but any control over its publication would likely be the responsibility of another function.

5.0. CONCLUSION

The absence of a self-reported principal role should not imply that product and process designers cannot play a significant role in sustainability. In contrast, product and process designers play an integral role in many of the action items included in this survey. Based on the survey findings and a comparison to literature, the product and process design function is prepared and positioned to contribute to the sustainability efforts of an organization by implementing measures to minimize and manage wastes through sustainability design principles, identifying and minimizing potentially adverse impacts on the

environment through a product-based environmental management system, and balancing the needs of the organization and its stakeholders by managing risks to employees, consumers, and neighbors.

The function self-identified supporting and involved roles in many of the action items because many of the items refer to the recording, organization, or reporting of information to various shareholders; the product and process design function plays an important role in the discussed items, but they generally are not involved in disseminating this information. Designers identified a supporting or involved role because they are principally in charge of design; their role may involve communicating design decisions and protocols to another professional function, but not reporting those decisions and protocols to shareholders.

This work has discussed the roles and responsibilities that the product and process design function are prepared to take on in the environmental sustainability and social responsibility efforts of an organization. It is important for the function to come to a consensus on the role they are prepared to play as they are most aware of the nature of their professional training and education. It is equally important for an organization to clearly define and document the roles and responsibilities it expects the profession to fulfill. Organizational structure will have an impact on the roles and responsibilities of product and process designers depending on the department the function is housed in, the size of the organization, the number of design professionals, and the presence or absence of potential collaborators. An organization must clearly delineate the roles and responsibilities at every level of the organization in order to fulfill its environmental sustainability and social responsibility goals.

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