



A more sustainable nail care service



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ABSTRACT

Nail care salons have become a profitable, familiar business around the world; however, this service business has been linked to occupational exposures and, occasionally, to air pollution. Despite these alleged links, there is currently no scientific evidence to conclude whether activities in nail salons affect the health of workers or the environment. Under this context of uncertainty, a Sustainable Service Program was conducted to prevent, eliminate, and/or reduce the creation of occupational and environmental risks in five nail salons in Hermosillo, Mexico and six nail salons in Sao Paulo, Brazil. The findings of this study indicate a need to strengthen the organizational structure of nail salons in order to address their general lack of strategic planning. The integration of occupational and environmental concepts was more feasible at the strategic level, but even with a low level of integration on the operating level, it was possible to pick some lowhanging fruits. There is nothing wrong with setting easier goals and targets at the beginning, but at some point, owners have to aim for more challenging goals. Hopefully, the program would improve after each iteration, and each nail salon would offer a more sustainable service. The Sustainable Service Program changed the way the participating salons operated, but without a doubt, this would not have been possible to implement without the partnership between nail salons, the University of Sonora, and the Paulista University. The scientific value of this article is the confirmation of a Sustainable Service Program as an effective tool for preventing, eliminating, and/or reducing risks at Small and Medium Enterprises. Notwithstanding the differences in economic circumstances in both countries, findings highlighted the benefits in participating nail salons, providing information on which to base future research on Sustainable Service Program applied to Small and Medium Enterprises.

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1. Introduction

1.1. Nail industry: an unsustainable development

The number of American nail care salons have increased substantially over the last decades. According to the [United States Department of Labor \(2014\)](#), there were 79,090 manicurists and pedicurists by May 2014 earning a mean hourly wage of \$10.82 US dollars and representing 3.6% of total employment. However,

behind this notable prosperity, there have been growing concerns over allegations of poor labor conditions, occupational risks, and environmental pollution ([Balkissoon, 2012](#)).

The starting point for this conflict was two studies conducted by [Quach et al. \(2008\)](#) and [Roelofs et al. \(2008\)](#) that attempted to establish a link between compounds in nail products, mainly volatile organic compounds (VOCs), and occupational diseases through multiple routes of exposure.

These studies caught the attention of other researchers, who continued this research line and reached similar conclusions: a potential chemical exposure to workers. For instance, [Henriks-Eckerman and Korva \(2012\)](#) found in their study a low exposure to methacrylates in nail salons, which cause irritation of skin, eyes and respiratory tract in short term exposure and in long term may cause skin sensitization and may have effects on the nervous system ([Campos et al., 2013](#); [NIOSH, 2015a, b](#)). Through air sampling,

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Alaves et al. (2013) found that workers are continually exposed to VOCs; for that reason, they suggested the use of personal protective equipment and the installation of engineering controls. Goldin et al. (2014) also demonstrated that the nail salon workforce is exposed to VOCs that exceeds typical levels found in residential and possibly other occupational environments.

The occurrence of musculoskeletal disorders has been another topic of inquiry. Harris-Roberts et al. (2011) studied manicure and office activities, and their findings suggest that nail technicians report high levels of work-related musculoskeletal complaints compared to unexposed workers, with the neck, shoulders, and back being the body parts where pain is most frequently reported (Alojado et al., 2015). Nail salon workers spend long hours standing or sitting; consequently, they are likely to have spine problems (Chaves et al., 2010). Scientific studies have confirmed the presence of work-related exposures to infectious microbiological agents, primarily bacteria and fungi (Ladeira and de Oliveira, 2012). Recognizing these hazards, US Occupational Safety and Health Administration (OSHA, 2012) has issued materials noting the potential for chemical exposure, aches and pain, and biological hazards in nail salons.

From the perspective of the social dimension of sustainable development, working conditions of immigrant workers have become increasingly important. According to Bernhardt et al. (2005), there are numerous examples of nail salons where immigrants are vulnerable to workplace violations, because job laws are often broken or because employment and labor laws do not legally cover immigrant workers.

The nail care industry is one of the major employers of Asian-American workers (Rho et al., 2011). In Southern California, self-employed Vietnamese women maintain a virtual monopoly over nail salons (Gold, 2014). Nearly forty percent of nail salon workers in the United States are Vietnamese, and in states with large Vietnamese populations, the percentage is even more significant (Le-Thanh, 2012).

In spite of having developed this nail niche, immigrant Vietnamese women are at a disadvantage in terms of economic affluence, because they earn less than those from other segments of the beauty industry (Eckstein and Nguyen, 2011). Wage and working-time violations are the most easily identified type of workplace violation (Bernhardt et al., 2008). In addition, they may have fewer opportunities to progress in their workplace (Yamane, 2012). This leads to a situation in which Vietnamese immigrants are willing to work in spite of the fact that some chemicals are carcinogenic and can cause allergic reactions (Liaw and Huang, 2012).

1.2. Cleaner production programs: an integrative approach

Cleaner Production is a very important tool to assisting EMSs to address environmental problems at the source. According to the United Nations Environment Program (UNEP, 1991), Cleaner Production (CP) is any integrated preventive strategy applied to processes and products in order to increase efficiency and reduce risks to human beings and the environment by continuously taking action to prevent pollution in every activity relating to processes, products, and services. The National Centers of Cleaner Production has been one of the most important disseminators of the philosophy, principles, and techniques of CP (Petek and Glavic, 2000; Eras et al., 2015; Luken et al., 2015). Universities and other academic and research institutions have also fostered the concept (Onasch et al., 2011; Delp et al., 2013).

Currently, there is a trend toward the integration of management standards (Asif et al., 2013; Simon et al., 2012; Nowicki et al., 2013). An integrated management system is a management system, which integrates several or all components of a business into one

coherent system to enable the achievement of its purpose and mission (Weiß and Bentlage, 2006). However, the procedures for implementing and monitoring an integrated management system are cumbersome and costly (Bénézech et al., 2001; Heras and Arana, 2010; Granly and Welo, 2014), which can affect the capacity of Small and Medium Enterprises (SMEs) to initiate one.

As an alternative to SMEs, voluntary programs based on the CP framework have emerged as a tool for reaching sustainable development (Staniskis and Stasiskiene, 2003), mainly for achieving environmental and economic benefits (de Brujin and Hofman, 2000; Kjaerheim, 2005; Altham, 2007), while neglecting occupational health issues (Munguía et al., 2010).

The obvious challenge for cleaner production programs is the integration of the core dimensions of sustainable development in an affordable way. A way to face this challenge is through what is known as a Sustainable Service Program (SSP), which uses the CP methodology as a foundation for integrating the economic, environmental, and social dimensions of sustainable development. It has been proven that SSPs increase the chances of SMEs to develop service strategies to secure long-term economic growth while improving environmental and working conditions (Zavala et al., 2011).

A practical contribution of the current study is to test that nail salons can use this framework to integrate the sustainability principles within their strategic planning in order to increase their long-term profitability while improving working and environmental conditions.

In this context, the purpose of this article is to provide empirical insights on which to base future research on Sustainable Service Program applied to Small and Medium Enterprises, particularly in nail salons in Mexico and Brazil.

2. Methods

Built off of the structure of a Cleaner Production program, a SSP to prevent, eliminate, and/or reduce the source of occupational and environmental risks was conducted in five nail salons in Hermosillo, Mexico and six nail salons in Sao Paulo, Brazil. These establishments were selected under a convenience sampling.

The program's framework was based on a continuous improvement cycle, the plan–do–check–act, which identifies opportunities and then proposes ideas for solving problems.

This iterative process has been tailored and validated by faculty at the University of Sonora to being implemented at SMEs, where there is a general dearth of adequate managerial and engineering skills.

The methods consisted of surveying all participating nail salons to characterize this service in both countries. Researchers gathered data about economics, demographics, current practices, regulatory framework, and occupational and environmental work practices in order to improve actual standards of productivity without affecting occupational conditions and environmental performance.

The total concentration of volatile organic compounds in each salon was measured using a direct-reading instrument, a photo-ionization detector, when the service was being carried out. The reading displayed represented the total concentration of volatile organic compounds in the salon. This concentration could be generated by multiple services carried out at the same time.

Lighting conditions were measured using a professional, high-accuracy light meter.

The Rapid Upper Limb Assessment tool was used to evaluate biomechanical and postural requirements of job tasks/demands on the upper arm, lower arm, wrist, neck, trunk, and legs body regions.

3. Results

3.1. Management support

It is well known that achieving top management support is vital for the success of any program. Meeting this requirement required periodical visits to explain the benefits of implementing such a program. The response rate to participate was 25% in Mexico and 18% in Brazil, which is relatively low, considering the 50% response rate previous studies (Quach et al., 2011). The main argument for not participating in this study was that owners were dealing with many operative issues and lacked a sustainability culture. On the other hand, those who agreed to participate expressed their willingness to protect health, safety, and the environment.

In order to prevent managerial shortcomings, the first task was to create a sustainability team. The team size was dictated by the amount of work that needed to be done and the time available. The team consisted of the owner, one or two workers, a graduate student, and one faculty member with a sustainability master's degree from the University of Sonora. In the Brazilian nail salons, a professor from the Paulista University was added to the team. With this composition, the university members provided expertise, leadership, and knowledge of sustainability programs, and the nail salon members provided sustainability expertise and technical knowledge.

A common situation in nail salons from both countries was the lack of strategic documents for encouraging sustainability initiatives—specifically, statements that indicate their vision, mission, and sustainability policies. Therefore, the team focused on resolving the lack of these statements.

According to Ehmke et al. (2004), the vision statement must contain three elements: a core ideology, an envisioned future, and recognition of service to stakeholders. The mission must outline “who we are, what we do, and for whom we do it.” In view of all these elements, a basic, common vision and mission statement was prepared and given to each nail salon, and each salon adapted the statement to its own needs. It was then possible to establish sustainability policies as a mean to achieve what was expressed in the mission statement; therefore, policies led the aim of the program's goals.

3.2. Planning

No matter the size of the business, good planning is vital for the success of the SSP, because this phase allowed fundamental decisions to be made about what the SSP hopes to accomplish and how the nail salons will accomplish those goals.

A situational diagnosis of operational information was gathered from the owners, workers, and labels on chemicals recipients. Current operational practices were observed during the provision of the service. Despite service similarities, each nail salon situation had unique aspects, requiring its own diagnosis.

3.2.1. Purchasing, inventory, and storage of chemicals

Nail salon products were bought in local supplies shops; the number of services offered during the week determined purchasing orders. There was no special room for storing the products; rather, products were arranged on shelves or on tables.

A product inventory was conducted in order to identify hazardous ingredients that may be present in nail salon products. Table 1 shows the list of toxic and hazardous substances found, according to Mexican standard NOM-010-STPS-1999 and Brazilian standard NR 15. Some hazardous ingredients were easy to identify on labels, but others were more difficult, because they were either not listed on labels or there were not any labels on the product.

3.2.2. Service characterization

There were three core processes involved in beautifying fingernails: gel polish manicure, enamel nail polish manicure, and acrylic nails extension. Each service was drawn in a process flow-chart through a three-month period of direct observation at the workplace in order to observe what and how the tasks were completed. This process provided a full understanding of the nail service, which is critical to identify sources of waste and occupational risks. Table 2 shows a summary of the occupational and environmental risks that were identified in Mexico and Brazil. It is necessary to highlight that biological risks were found only in Brazilian nail shops because they trim nails and cuticles, which was not the case in Mexican nail shops.

3.2.3. Risks evaluation

Once the chemical, ergonomic, physical, and biological hazards were identified; they were evaluated to determine the magnitude of each risk and to estimate each hazard's probability of causing harm to workers.

3.2.3.1. Chemical hazards. The first step for evaluating the chemical exposure within nail salons was to compile information in Material Safety Data Sheets such as the physical and chemical properties and the health, safety, fire, and environmental hazards of the substances contained in nail salon products. This sheets were compiled from publicly available sources, because nail salons did not keep them on site. Much was learned from Material Safety Data Sheets; exposure to volatile organic compounds caused the most concern, because some research has claimed that they are carcinogenic and adversely affect the health of workers (EPA, 2015). The term volatile organic compound has become complicated and is not yet clearly understood. However, for the purpose of this study, the WHO's definition of VOC was used (1989 cited in Mølhave et al., 1997), which states that a volatile organic compounds is any compound with a boiling point between 50 and 100 °C to 240–260 °C. Table 3 summarizes the volatile organic compounds found on product labels, their CAS number and the National Fire Protection Association classification.

As Table 4 and Table 5 show, the total concentration of volatile organic compounds in each salon was higher at the end of the service than at the beginning.

3.2.3.2. Ergonomic hazards. In general, the Mexican nail salons reached a level where the ergonomic risk is low, which means that further investigation is needed, because Mexican nail salons may require changes in the design of the task and/or the workplace. On the other hand, the Brazilian nail salons reached a higher level of ergonomic risk, given that two of them required immediate changes in the design of their tasks and the others required rapid changes. Table 6 and Table 7 show the ergonomic assessment of the Mexican and Brazilian nail salons, respectively.

3.2.3.3. Environmental hazards. Each workstation within the nail salons was environmentally surveyed in order to assess the likelihood of injury by physical hazards that can reduce the optimum conditions for efficient performance by the service workers.

As it shown in Table 8, with the exception of one Mexican nail salon, illumination levels comply with the Mexican Lighting Standards. In general, workstations were uniformly free of shadows and had no glare light, resulting in efficient sight. Similarly, all the workstations in the Brazilian nail salons, except one workstation in one salon, met Brazilian lighting standards (see Table 9). The indoor temperature was held in the range of 21–25 °C/69–75 °F; therefore, thermal stress was not detected. Finally, noise also was surveyed, but workers were not exposed to levels higher than the standards in either country.

Table 1
Hazardous ingredients in nail salon products.

| Hazardous ingredients in nail services | | | | | | |
|--|------------|---------------------|---------------------|---------|-----------|--------|
| Ingredient | CAS number | Hazardous | | Service | | |
| | | Mexico ^a | Brasil ^b | Gel | Extension | Enamel |
| Methyl ethyl ketone | 78-93-3 | Yes | Yes | Yes | Yes | No |
| Ethyl alcohol | 64-17-5 | Yes | Yes | Yes | Yes | Yes |
| Butyl acetate | 123-86-4 | Yes | No | Yes | Yes | Yes |
| Ethyl acetate | 141-78-6 | Yes | Yes | Yes | Yes | No |
| Diacetone alcohol | 123-42-2 | Yes | No | Yes | Yes | No |
| Phosphoric acid | 7664-38-2 | Yes | No | Yes | Yes | No |
| Acetone | 67-64-1 | Yes | Yes | Yes | Yes | Yes |
| Isopropyl alcohol | 67-63-0 | Yes | Yes | Yes | Yes | Yes |
| Isobutyl acetate | 110-19-0 | Yes | No | Yes | Yes | No |
| Hydroquinone | 123-31-9 | Yes | No | Yes | Yes | No |
| Toluene | 108-88-3 | Yes | Yes | No | No | Yes |
| Dibutyl phthalate | 84-74-2 | Yes | No | No | No | Yes |
| n-Butyl alcohol | 71-36-3 | Yes | Yes | No | No | Yes |
| Formaldehyde | 50-00-0 | Yes | Yes | No | No | Yes |
| Butene | 106-97-8 | Yes | Yes | No | No | Yes |
| Propane | 74-98-6 | Yes | Yes | No | No | Yes |
| Propyl acetate | 109-60-4 | Yes | No | Yes | No | No |
| Benzoyl peroxide | 94-36-0 | Yes | No | No | Yes | No |
| Butylated hydroxytoluene | 128-37-0 | Yes | No | No | Yes | No |

^a According to Mexican Standard NOM-010-STPS-1999.

^b According to Brazilian Standard Norma Regulamentadora 15.

3.2.3.4. *Engineering and administrative controls.* There was no general or local exhaust ventilation installed in the participating nail salons. Air was exhausted from salons using air movement produced by small fans. In the Brazilian nail salons, workers used an

autoclave for decontaminating instruments, but there were no exposure control plans for blood or cuticles. Administrative controls were lacking, though short resting periods were taken between one service and the next. All the participating nail salons

Table 2
Occupational and environmental risks.

| Risk | Description |
|---------------------|---|
| Occupational Risks | Chemical: Exposition to VOC |
| | <p><i>Acetone:</i> headache, dizziness, nausea, sore eyes, skin or throat.</p> <p><i>Butyl acetate:</i> headaches, sore eyes, skin, nose, mouth and throat.</p> <p><i>Dibutyl phthalate:</i> nausea, sore eyes, skin, nose, mouth and throat. Prolongued exposure to high concentrations can have other serious negative effects.</p> <p><i>Ethyl Acetate:</i> sore eyes, skin, nose, mouth and throat; high concentrations can cause blackouts.</p> <p><i>Formaldehyde:</i> respiratory complications, such as coughing, asthma attacks, panting or similar; allergic reactions; sore eyes, skin and throat. It may also cause of cancer.</p> <p><i>Methacrylic Acid:</i> Skin scalding and sore eyes, skin, nose, mouth and throat. High concentrations of this chemical can cause respiratory complications.</p> <p><i>Toluene:</i> Dry or cracked skin; headache, nausea and hypesthesia; sore eyes, nose, throat and lungs; damage to liver and kidneys; fetal damage.</p> |
| | Physical: Illumination |
| | Accidents. |
| | <i>Visual fatigue:</i> Eye problems (dryness, itchiness or stinging), headache, fatigue, irritability, bad temper, etcetera. |
| | Physical: Noise |
| | Oral communication difficulties. |
| | Diminished hearing capacity. |
| | Sleep and rest deprivation. |
| | Accidents. |
| | Stress. |
| | Negative performance effects. |
| | Buzzing and tinnitus. |
| | <i>Local injuries:</i> minor sight injuries, cramping. |
| | <i>General injuries:</i> heatstroke, heat exhaustion, syncope (fainting) and heart stroke. |
| | <i>Contact with infectious agents:</i> Hepatitis B and C virus, HIV. |
| | <i>Infections:</i> mycosis. |
| | Ergonomic: Posture load |
| | Musculoskeletal disorders. |
| | Cuts. |
| | Others |
| | Blows. |
| | Fire hazard. |
| Environmental Risks | Soil pollution |
| | Solid waste production. |
| | Hazardous waste production. |
| | Aire pollution |
| | VOC emission. |
| | Particle emission. |
| | Natural resource usage |
| | Electricity usage. |
| | Water usage. |
| | Material usage. |

Table 3

Volatile organic compounds in nail salons.

| Volatile organic compounds (VOCs) in nail services | | | | | |
|--|------------|---------------------|--------------|------------|-----------------|
| Ingredient | CAS number | NPFA classification | | | |
| | | Health | Flammability | Reactivity | Special |
| Methyl ethyl ketone | 78-93-3 | 1 | 3 | 0 | – |
| Ethyl alcohol | 64-17-5 | 0 | 3 | 0 | – |
| Butyl acetate ^a | 123-86-4 | 1 | 3 | 0 | – |
| Ethyl acetate | 141-78-6 | 1 | 3 | 0 | – |
| Diacetone alcohol ^b | 123-42-2 | 1 | 2 | 0 | – |
| Phosphoric acid ^{b,c} | 7664-38-2 | 2 | 0 | 0 | – |
| Acetone | 67-64-1 | 1 | 3 | 0 | – |
| Isopropyl alcohol | 67-63-0 | 1 | 3 | 0 | – |
| Isobutyl acetate ^a | 110-19-0 | 1 | 3 | 0 | – |
| Toluene | 108-88-3 | 2 | 3 | 0 | – |
| n-Butyl alcohol ^a | 71-36-3 | 1 | 3 | 0 | – |
| Propyl acetate | 109-60-4 | 1 | 3 | 0 | – |
| Benzoyl peroxide ^{c,d} | 94-36-0 | 1 | 4 | 4 | OX ^e |

^a A harmful contamination of the air will be reached rather slowly on evaporation of this substance at 20 °C.^b A harmful contamination of the air will not or will only very slowly be reached on evaporation of this substance at 20 °C.^c This ingredient is not detected by a Photoionization Detector (PID).^d Evaporation at 20 °C is negligible; a harmful concentration of airborne particles can, however, be reached quickly when dispersed, especially if powdered.^e Oxidizer.**Table 4**

Total volatile organic compounds concentration in Mexican nail salons.

| TVOC Monitoring/Service | Salon 1 | | Salon 2 | | Salon 3 | | Salon 4 | | Salon 5 | |
|-------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | UA (ppmV) | EG (ppmV) | UA (ppmV) | EG (ppmV) | UA (ppmV) | EG (ppmV) | UA (ppmV) | EG (ppmV) | UA (ppmV) | EG (ppmV) |
| Initial Monitoring | 4 | 3 | 3 | 2.3 | 36 | 32 | 29.7 | 36 | 8.2 | 4.6 |
| Final Monitoring | 4.4 | 3.8 | 10.6 | 13 | 67 | 42.2 | 77.7 | 67 | 18.6 | 6.8 |

Table 5

Total volatile organic compounds concentration in Brazilian nail salons.

| TVOC Monitoring/Service | Salon 1 | Salon 2 | Salon 3 | | Salon 4 | Salon 5 | Salon 6 |
|-------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | ER (ppmV) | ER (ppmV) | ER (ppmV) | EG (ppmV) | UA (ppmV) | ER (ppmV) | ER (ppmV) |
| Initial Monitoring | 1.7 | 7.4 | 6.5 | 15 | 6.5 | 0 | 2.2 |
| Final Monitoring | 69.1 | 37.6 | 9.6 | 20.7 | 10 | 1.2 | 2.4 |

applied good housekeeping practices such as orderly storage and movement of materials and salon cleaning.

3.2.3.5. Environmental impact. The nail salons generated minimal environmental damage, due to their low concentration of total volatile organic compounds emissions; however, even these low concentrations might be a contributing factor to air pollution and might impact the global climate (Sahu, 2012). Waste disposal is another potential source of pollution; the municipality in each city of both countries picked up empty containers up like household waste, including gauze used in handling blood, but empty containers may retain product residue and vapors that could pollute either the ground or underground aquifers. Finally, the nail care salons consumed a small amount of energy; therefore, they are minimal contributors to greenhouse gas emissions. This is consistent with the US Energy Star Portfolio Manager, which assigns a low national median source Energy Use Intensity (EUI) metric of 100.4 kBtu/ft² to this kind of service (Energy Star, 2014).

3.3. Implementation

Strategic planning in the participating nail salons occurred during the first three months of the study; within this timeframe, they defined their vision and mission statements as well as their

sustainability policies. During the operative stage of the program, owners preferred goals that were easier, faster, and more affordable. Table 10 shows the alternatives to prevent, eliminate, or reduce risks.

4. Discussion

In order to be able to generate meaningful insights for adopting sustainable service strategies in nail salons, it is necessary to conceive these establishments as service providers that take into account the economic, social, and environment dimensions of sustainable development. This includes addressing both human health and environment concerns as part of the responsible management of products, processes, and tasks.

A SSP based on a cleaner production framework can be an effective tool for achieving this goal. Previously, voluntary CP programs have proven their usefulness in achieving environmental and economic benefits in SMEs (Van Hoof and Lyon, 2013). Findings in this study also showed that these programs are useful for occupational and safety issues.

It is necessary that the implementation of CP programs takes place on a nationwide scale (Hoque and Clarke, 2013). Mexico and Brazil are often referenced as part of an emerging Latin American cluster of countries; however, both countries are economically

Table 6
Ergonomic assessment for Mexican nail salons.

| Ergonomic risk evaluation: Rula | | | | | |
|---------------------------------|---|---|---|---|--|
| Evaluated parts | Punctuation | | | | |
| | Salon 1 | Salon 2 | Salon 3 | Salon 4 | Salon 5 |
| Group A | | | | | |
| Forearm | 2 | 2 | 2 | 2 | 2 |
| Wrist | 2 | 2 | 2 | 2 | 2 |
| Arm | 2 | 2 | 2 | 2 | 3 |
| Wrist twist | 1 | 1 | 1 | 1 | 1 |
| <i>Punctuation Group A</i> | 3 | 3 | 3 | 3 | 4 |
| Muscle | 1 | 1 | 1 | 1 | 1 |
| Weight | 0 | 0 | 0 | 0 | 0 |
| <i>Punctuation Group C</i> | 4 | 4 | 4 | 4 | 5 |
| Group B | | | | | |
| Legs | 1 | 1 | 1 | 1 | 2 |
| Neck | 3 | 2 | 3 | 2 | 3 |
| Thorax | 2 | 2 | 2 | 2 | 2 |
| <i>Punctuation Group B</i> | 3 | 2 | 3 | 2 | 4 |
| Muscle | 1 | 1 | 1 | 1 | 1 |
| Weight | 0 | 0 | 0 | 0 | 0 |
| <i>Punctuation Group D</i> | 4 | 3 | 4 | 3 | 5 |
| Final Punctuation Level | 2 | 2 | 2 | 2 | 3 |
| Action | Further investigation is needed. They may require changes in the design of the task and/or the workplace. | Further investigation is needed. They may require changes in the design of the task and/or the workplace. | Further investigation is needed. They may require changes in the design of the task and/or the workplace. | Further investigation is needed. They may require changes in the design of the task and/or the workplace. | Rapid change is required in the design of the task and/or the workplace. |

polarized (Robles, 2012). Thus, one might expect small business strategies to find significant differences, but it was found that there are not significant differences in the small business strategies in Mexico and Brazil.

To get started, the profile of entrepreneurship in nail salons resulted in similarities in both nations. Nail salons are playing a very important role in fostering national economic growth. In 2014, the Mexican Institute of Statistics, Geography, and Informatics (INEGI, 2014) reported in the economic census that there were 160,811 establishments in the salons, beauty clinics, and hair-dressers category; in the same year, the Brazilian Micro and Small

Business Support Service reported 300,000 formalized businesses categorized “hairdressers and manicures” (DHoje Interior, 2014).

In both Mexico and Brazil, nail salons operate as sole proprietorship businesses with no more than five workers per salon. Unlike the United States, where immigrants have developed a nail niche (Keefe, 2015), national ownership is ordinary in Mexican and Brazilian nail salons; consequently, Mexican and Brazilian workers do not suffer from discrimination, but they are still struggling to earn a modest living.

Implementing CP initiatives takes time because it is necessary to make substantial organizational and technological changes

Table 7
Ergonomic assessment for Brazilian nail salons.

| Ergonomic risk evaluation: Rula | | | | | | |
|---------------------------------|--|--|--|--|--|--|
| Evaluated parts | Punctuation | | | | | |
| | Salon 1 | Salon 2 | Salon 3 | Salon 4 | Salon 5 | Salon 6 |
| Group A | | | | | | |
| Forearm | 2 | 2 | 2 | 2 | 2 | 2 |
| Wrist | 2 | 2 | 2 | 2 | 2 | 2 |
| Arm | 3 | 3 | 2 | 2 | 3 | 2 |
| Wrist twist | 1 | 1 | 1 | 1 | 1 | 1 |
| <i>Punctuation Group A</i> | 4 | 4 | 3 | 3 | 4 | 3 |
| Muscle | 1 | 1 | 1 | 1 | 1 | 1 |
| Weight | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Punctuation Group C</i> | 5 | 5 | 4 | 4 | 5 | 4 |
| Group B | | | | | | |
| Legs | 1 | 1 | 2 | 1 | 1 | 1 |
| Neck | 4 | 3 | 4 | 3 | 4 | 4 |
| Thorax | 4 | 4 | 3 | 4 | 4 | 4 |
| <i>Punctuation Group B</i> | 7 | 5 | 7 | 5 | 7 | 7 |
| Muscle | 1 | 1 | 1 | 1 | 1 | 1 |
| Weight | 0 | 0 | 0 | 0 | 0 | 0 |
| <i>Punctuation Group D</i> | 8 | 6 | 8 | 6 | 8 | 8 |
| Final Punctuation Level | 7 | 7 | 6 | 6 | 7 | 6 |
| Action | Changes in the design of the task and/or the workplace are immediately necessary | Changes in the design of the task and/or the workplace are immediately necessary | Rapid change is required in the design of the task and/or the workplace. | Rapid change is required in the design of the task and/or the workplace. | Changes in the design of the task and/or the workplace are immediately necessary | Rapid change is required in the design of the task and/or the workplace. |

Table 8
Lighting evaluation in Mexican nail salons.

| Salon | NOM-025-STPS-2013 (lux) | Measurement obtained (lux) | Compliance |
|---------|-------------------------|----------------------------|------------|
| Salon 1 | 750 | Workstation 1: 250–370 | No |
| | | Workstation 2: 300–310 | No |
| Salon 2 | 750 | Workstation 1: 2750–2760 | Yes |
| | | Workstation 2: 980–1030 | Yes |
| | | Workstation 3: 2750–2770 | Yes |
| Salon 3 | 750 | Workstation 4: 2070–2160 | Yes |
| | | Workstation 1: 789–900 | Yes |
| | | Workstation 2: 1300–1500 | Yes |
| | | Workstation 3: 1430–1530 | Yes |
| | | Workstation 4: 1106–1315 | Yes |
| | | Workstation 5: 1230–1350 | Yes |
| | | Workstation 6: 989–1140 | Yes |
| | | Workstation 7: 1160–1305 | Yes |
| | | Workstation 8: 683–920 | No |
| Salon 4 | 750 | Workstation 9: 810–1900 | Yes |
| | | Workstation 1: 2110–1160 | Yes |
| Salon 5 | 750 | Workstation 2: 2110–1161 | Yes |
| Salon 5 | 750 | Workstation: 755–1790 | Yes |

Table 9
Lighting evaluation in Brazilian nail salons.

| Salon | NBR 5413/92 (lux) | Measurement obtained (lux) | Compliance |
|---------|-------------------|----------------------------|------------|
| Salon1 | 500–1000 | Workstation 1: 650–680 | Yes |
| | | Workstation 2: 740–860 | Yes |
| | | Workstation 3: 500–510 | Yes |
| | | Workstation 4: 450–500 | No |
| Salon 2 | 500–1000 | Workstation: 617–702 | Yes |
| Salon 3 | 500–1000 | Workstation 1: 2440–2480 | Yes |
| | | Workstation 2: 2450–2480 | Yes |
| | | Workstation 3: 840–850 | Yes |
| | | Workstation 4: 840–850 | Yes |
| | | Workstation 5: 820–880 | Yes |
| | | Workstation 6: 820–880 | Yes |
| | | Workstation 7: 810–820 | Yes |
| Salon 4 | 500–1000 | Workstation 1: 586–650 | Yes |
| | | Workstation 2: 624–663 | Yes |
| | | Workstation 3: 630–663 | Yes |
| Salon 5 | 500–1000 | Workstation: 520–650 | Yes |
| Salon 6 | 500–1000 | Workstation: 575–900 | Yes |

(Fresner, 1998; Lopes et al., 2013). Preferences are differentiated; while some are inclined to place more importance on organizational changes than to adopt new technologies (Canal and Gonçalves, 2015), others invest and dedicate resources and efforts in technological innovation to solve environmental problems (Severo et al., 2012).

Organizational change was a priority for preparing and launching the implemented programs, because the participating nail salons lacked strategic planning and long-term vision. The latter was not surprising, given that fact that SMEs are characterized by a lack of managerial skills (Jahur and Quadir, 2012), which often is referenced as a root cause of failure (Okpara, 2011; Ropega, 2011).

Table 10
Sustainability alternatives.

| Alternatives | % |
|-------------------------------|-----|
| Strategic Planning | 100 |
| Training | 100 |
| Personal Protection Equipment | 100 |
| Work Station Improvement | 30 |
| Product Substitution | 20 |
| Engineering Control | 10 |

There is an enormous potential for the integration of occupational and environmental perspectives under the umbrella of a SSP; yet, the program's framework requires commitment from top management at the earliest stage; management support was reached after periodical visits to explain the potential benefits of implementing such a program. With the purpose of complying with several standards at the same time, the implemented SSPs integrated environmental and occupational concerns by preventing, eliminating, or reducing risks at the source.

At the strategic level, the participating nail salons adopted new vision and mission statements as well as sustainability-focused policies. The willingness to tackle sustainability issues in this entrepreneurial culture is particularly noteworthy, considering that past experiences in small business indicate that these kinds of organizations are less involved in CP practices than larger business (Andrews et al., 2002).

On the other hand, at the operative stage, the level of integration of the Sustainable Development dimensions was less evident. This can be explained by the struggle against regulatory, institutional, market, financial, technical, informational, managerial and organizational barriers that promoters of CP have to face (Marlow et al., 2012; Fung, 2014; Soklic and Jelenc, 2014).

Previous studies confirmed that most of the chemical concentration levels in nail salons were below most occupational standards; moreover, sometimes it was not possible to assess the type and extent of health problems associated with chemical exposure (Quach et al., 2011). In this study, the scientific evidence was not sufficiently strong to establish the certainty of a cause and effect relationship; consequently, chemical exposure remains a big challenge.

Under this context of uncertainty, adhering to the precautionary principle seems to be a good initiative. This principle encourages policies that protect human health and the environment under uncertainty risks (Kriebel et al., 2001) by calling for preventive action in the face of uncertain, but suggestive, evidence of risk, especially when safer alternatives exist (Brody et al., 2005).

The development of goals varied between nail salons, depending on their initial situational analysis and their financial structure. Despite the fact that the impetus for CP investment comes more from the benefits to be obtained than the amount of investment (Dong et al., 2012), most owners decided to implement initiatives that could prevent, eliminate, and/or reduce occupational and environmental risks with an affordable investment.

The SSP is an iterative process that is repeatedly conducted to achieve goals; therefore, there is nothing wrong with setting easier goals and targets at the beginning, but at some point, owners have to set goals that are more difficult. Hopefully, the program would improve after each iteration, each nail salon is going to offer a more sustainable service.

Often, SMEs need partnerships to overcome barriers (Hussey and Eagan, 2007). With the support of consultants from the University of Sonora and the Paulista University, participating nail salons engaged in a SSP that changed the way these salons operated. The success of collaborative projects between SMEs and universities is still a topic of discussion in scientific forums (Buganza et al., 2014), but without a doubt, the program would not have been possible to implement without the help of these higher education institutions and the nail salon owners' willingness to participate in such a program.

5. Conclusions

This article is the first to propose the use of an integrative approach, through a SPP, in this industry. Previous research in sustainability in the nail care industry has mainly emanated from

concerns to protect workers by controlling hazardous substances. However, sustainability in the nail care industry has reached the point where integrative approaches are necessary for continued progress in the field.

As mentioned earlier, this article was aimed at providing empirical insights on which to base future research on Sustainable Service Program applied to Small and Medium Enterprises. Although this study is not expected to be generalized, it has provided several insights for enriching the debate of how nail salons can become a more sustainable service provider within the nail care industry. Listed below are the most outstanding:

The scientific value of this article is the confirmation of a SSP as an effective tool for preventing, eliminating, and/or reducing risks at SMEs.

A practical contribution of the current study is that nail salons can use this framework to integrate the sustainability principles within their strategic planning in order to increase their long-term profitability while improving working and environmental conditions.

Notwithstanding the differences in economic circumstances in both countries, findings highlighted benefits in the participating nail salons, providing information on which to base future research about the application of this tool in small and medium enterprises.

It is necessary to strengthen the organizational structure of nail salons in order to address their general lack of strategic planning.

The integration of environmental and occupational concepts was more feasible at the strategic level, but even a low level of integration on the operating level is a step forward in the actual stock of knowledge, because until quite recently, research in nail salons has focused primarily on characterizing workplace exposures, leaving environmental issues as an ancillary topic.

The willingness to tackle sustainability issues in this entrepreneurial culture was considered a big success, given that SMEs usually do not get involved in sustainability initiatives.

When it comes to reducing chemical exposure, the program must be grounded in the precautionary principle, because it is very difficult to establish scientifically a cause and effect relationship between total volatile organic compounds and occupational diseases or disorders.

Finally, this study strongly reaffirmed the necessity of SMEs to partner with higher education institutions in order to improve their daily services or products.

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