



Original article

Women working in the Thai coloured gemstone industry: Insights from entrepreneurial ecosystems

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ARTICLE INFO

Keywords:

Gender

Thailand

Gemstone supply chain

Entrepreneurial ecosystem

ABSTRACT

The Thai gem and jewellery industry employs up to 900,000 people including many women in the formal sector and many more in the informal sector. This contrasts with the limited participation of women in the gem industry in India and Sri Lanka. There is little research into the role of women in the operation of the industry.

This research used entrepreneurship ecosystem theory to understand the Thai institutions that support and hinder women in the Thai industry. Interviews were conducted across Bangkok and Chanthaburi and detailed life histories were recorded of women owned businesses in the Jewellery Trade Centre.

Thai women are influential in the industry and there are positive workplaces where women can play an important role. Universities and government institutions are key enablers but there is still gendered division of labour with women earning less than men in some sectors. Cultural norms also prevent them from achieving their full potential. Some women are working informally in very poor conditions.

As Thailand seeks to become the global gem and jewellery industry leader, it needs to foster an entrepreneurial ecosystem that develops a new generation of gemstone entrepreneurs, especially its women and youth.

1. Introduction

Coloured gemstones—the trade name for all precious coloured gemstones other than diamond—continue to be in great demand by jewelers and watchmakers across the globe. The worth of trade in rough stones (excluding jade) is estimated at between USD 2 and 3 billion (Shortell and Irwin, 2017). Today, Africa provides much of the rough material to long established, traditional processing and transformation centers in Sri Lanka, India, and Thailand. Apart from the operations of Gemfields, a British large-scale miner with operations in Zambia and Mozambique, and Fura Gems, a Canadian large-scale miner with operations in Mozambique, African coloured gemstones are still largely mined by small-scale operators including many women. Sapphires along with rubies and emeralds are high growth stones in the Bangkok market (GIT, 2017) and the Thai industry has long held knowledge about how to best heat treat corundum (the mineral name for ruby and sapphire) to transform it into bright coloured rubies and sapphires. Certifying the identity and quality of these stones requires a high degree of experience and training, and the process of treating and value addition of these stones is an equally specialized craft. While African enterprises which certify and add value to gemstones through cutting, polishing, and jewellery-making do exist, they are underdeveloped and lacking in staff and sufficient market knowledge. They cannot yet compete in the market nor with the highly developed networks, knowledge and skills

levels, and volume of workshops and skilled workers that have existed in Sri Lanka, India, and Thailand for decades.

This paper is the third in a series looking at the role of women in the sapphire value chain from women sapphire miners (Lawson, 2018) and women sapphires traders in South West Madagascar (Lawson and Lahiri-Dutt, forthcoming) to women gemmologists, cutters, polishers, setters and business owners working with gemstones, and sapphires in particular, in Thailand. (Lawson, 2018; Lawson and Lahiri-Dutt, forthcoming). Madagascar is one of the world's largest producers of a wide variety of coloured sapphire (Shigley et al., 2010); the Gem and Jewellery Institute of Thailand (GIT) estimates that 80% of sapphires being worked upon in Thailand are from Madagascar, although this is not reflected in official records as many of the stones are imported through informal channels (stakeholder interview; see also Shor and Weldon, 2009). Exploring the ways in which women work with these stones thus provides a thematic link to earlier work with Malagasy sapphire miners and traders (see Lawson, 2018; Lawson and Lahiri-Dutt, forthcoming). Through observations and a series of interviews and work life histories of women working in the gem industry in Thailand, this paper will give a critical overview of some of the institutions in the Thai gemstone entrepreneurial ecosystem which have enabled women to participate in the gem economy and analyse the life stories of three successful female gemstone entrepreneurs working in the Jewellery Trade Center (JTC). While not seeking to give any definitive comments about the status of

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<https://doi.org/10.1016/j.exis.2019.08.002>

Received 9 February 2019; Received in revised form 24 July 2019; Accepted 7 August 2019

Available online 22 August 2019

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women working in the industry, it will bring to the fore critical perspective about factors which both enhance and hinder their contribution, and also make a case for how their contribution should be understood. Understanding this could be vital for the innovation required to move the industry forward given Thailand's aim to become the world's gem and jewellery trading hub within five years (GIT, 2018).

2. Gender and the gemstone industry in Africa and Asia

Although jewellery for women is the major end point for most cut and polished coloured gemstones, women's role in the supply chain from extraction through processing has not been researched or documented in any comprehensive way. In Africa, many women are actively engaged in small-scale mining (Eftimie et al., 2012) and women can be seen working in coloured gemstone deposits, typically reworking tailings, but also trading in small stones across Madagascar, Zambia, Mozambique, Malawi, Tanzania, and Kenya. Some research is beginning to emerge about their lives, for example, Walsh (2003), commenting on Malagasy women in sapphire-mining towns, notes women seem to use money from sales more strategically than men; they save for the purchase of cattle and sometimes even opt for sexual relationships with African and Thai buyers in order to gain better access to stones. In their field ethnography of women sapphire miners and traders, Lawson (2018) and Lawson and Lahiri-Dutt (2019) have found that the trade provided women with a vital revenue flow and brought them some independence and dignity. Some women dealers who have progressed to owning their own mines and work internationally in coloured gemstones are beginning to be noticed and their success stories are being documented, for example, Miriam Kamau, the owner of Mimo Gems Traders Ltd in Nairobi (Tao and Lucas, 2018).

Sadly, such success is not the norm for women gemstone miners or traders in Africa. Trade is largely dominated by local middlemen and Indian, Sri Lankan, and Thai businessmen and occasionally their local wives. Some recent developments for women in Madagascar, including training in basic field gemmology and basic cutting and polishing, are promising (Archuleta and Palke, 2018). In August 2018, a women's lapidary center was opened in Sakaraha, in the heart of the sapphire mining area, managed by a committee of three groups of women. Many women can now cut a simple cabochon, but only a handful can cut facets. They will need mentoring to establish meaningful markets; without an entrepreneurial ecosystem with institutional support and careful marketing, local people, and women in particular, are not easily able to create successful businesses in value addition (Lawson and Harimalala, 2016).

Tanzania's Development Vision 2025 started raising funds in 2012 to train local women in mineral value-added skills, such as lapidary activities, jewellery designing, and manufacturing technology. The country has made progress in training with 47 women receiving intensive training in lapidary functions using Indian instructors and a 7-month lapidary skills course, but in reality value addition is still in its infancy stage (Rough and Polished, 2017), with a lack of experts in the field. In Madagascar, the L'Institut de Gemmologie de Madagascar (IGM), established in 2003 with funds from the World Bank, 2018a, 2018b continues to deliver the highest quality gemmology courses (Gem-A) and a suite of lapidary courses. Unfortunately, its fees are prohibitive for most Malagasy working in the sector. Scholarship opportunities in the past have trained a number of women now working in the industry as workshop leads or business owners (Lawson and Harimalala, 2016).

In India and Sri Lanka, both global hubs for coloured gemstones, value addition to gemstones through cutting, polishing, and jewellery-making is still traditionally a male-dominated domain. In a recent survey of 61 gem-cutting factories in Jaipur, women comprised a meager 6% of the workers and they were restricted to smaller family-based workshops (WHWB (Workplace Health Without Borders), forthcoming). Sri Lanka has a small percentage of expert women cutters as can be seen in a video report by Lucas et al. (2014) and the present research uncovered a Sri Lankan female-owned lapidary workshop employing more women than men cutters (stakeholder interview). However, women in value addition or business are not

the norm either in Sri Lanka or in the sapphire towns of Madagascar, which are themselves dominated by Sri Lankan male traders. In Pakistan a striking exception is the Swat valley emerald fields where Michelou (2018) reports on a successful project for local women, usually the wives of trained miners, who cut up to 3 mm emeralds for a European luxury firm; this firm pays a premium for stones with a transparent supply chain.

In Myanmar women play an active role in both mining tailings and handling sales of stones in the market. Handpickers or *kanase* are groups historically comprising women, who have had the right to rework ruby tailings and sell their stones since colonial times (Lucas and Pardieu, 2014; Newman, 2018). In Luc Yen in Vietnam, women take the lead in mining and notably in the commerce of highly prized bright blue and pink spinel and also in creating gemstone "paintings" (Trivier, 2018).

Thailand is one of the world's most vibrant gem and jewellery trading centers and the major global hub for the cutting and polishing of ruby and sapphire (Shortell and Irwin, 2017). Compared with India and Sri Lanka, women appear to take a much more active role in the gem trade, but there have been no supporting studies to confirm or explore this. This paper asks two questions: What factors in the Thai gemstone entrepreneurial ecosystem enable or hinder women's participation? and What impact do women have on the Thai gemstone entrepreneurial ecosystem?

This paper seeks to address these questions by uncovering the extent to which women are able to participate in the Thai gemstone entrepreneurial ecosystem. It brings a critical perspective about how women's contribution should be understood and appreciated. Such understanding could be vital for the Thai gem and jewellery industry as it seeks the innovation required to move forward and become the global center in the industry. The concept of the entrepreneurial ecosystem and the role institutions play in the ecosystem are helpful in framing this research.

3. The entrepreneurial ecosystem

An entrepreneurial ecosystem can be defined as a "conceptual umbrella for the benefits and resources produced by a cohesive, typically regional, community of entrepreneurs" (Spigel and Harrison, 2018: 152) where institutions and entrepreneurs are interdependent, influencing, and being influenced by each other (Brush et al., 2018). The original notion referred to interdependent workers working in a geographical region influencing the economy and new business start-ups (Brush et al., 2018), often catalyzed and driven by a regional resource, such as oil and gas, or, in the Thai case, historical access to ruby and sapphire. Isenberg (2011) and the World Economic Forum (WEF, 2013) provide useful and influential modeling of the elements of an entrepreneurial ecosystem. WEF (2013) mentions eight ecosystem pillars: markets, human capital, finance, mentoring, regulatory framework and infrastructure, education, universities, and cultural support.

Spigel (2017: 52) groups entrepreneurial ecosystem attributes into three categories:

- culture: beliefs, outlooks, and stories about entrepreneurship within a region;
- social: the networks which enable resources and knowledge to be shared, investment capital, mentors, and dealmakers, worker talent and
- material: institutions and organizations including government and policy "rooted in a particular place that support high growth entrepreneurship" (Spigel and Harrison, 2018: 153) universities, physical structure, and open markets.

However, a significant omission from entrepreneurial ecosystems research and theory is a consideration of the role of gender (Brush et al., 2018; Spigel and Harrison, 2018). The following section discusses some of the factors affecting women in entrepreneurial ecosystems.

3.1. Women in entrepreneurial ecosystems

Women's participation in entrepreneurial ecosystems may be limited by de-jure and de-facto inequity in access to and control over land and

property rights (Meinzen-Dick et al., 1997). In formal institutions of some jurisdictions gender inequity is institutionalized in laws or traditions that prevent women from owning or inheriting land or taking a bank loan independently, without the presence of a male relative (Hampel-Milagrosa, 2010). Labor market rules regarding women's participation in certain activities such as working at night or while pregnant, and lack of child care also limit their role and activity (Brush et al., 2018). These considerations are important in gemstone entrepreneurship because women may find their access to mines and mine work restricted.

Women's entrepreneurial activity can also be inhibited by normative practices and hidden aspects of informal practices and norms such as 'the rules of the game' and who can play (Martí and Mair, 2009). Entrepreneurship, for example, is traditionally considered a masculine activity and cultural institutions regarding women's roles mean women entrepreneurs continue to juggle the burden of family care with business (Brush et al., 2018). Other examples include institutions, formal and informal, that result in there being less women entrepreneurs present across disciplines of science, technology, engineering, and mathematics and in positions of leadership, for example, on the boards of companies (Brush et al., 2018). A study of national entrepreneurial ecosystems of 75 countries across 14 years by Hechavarría and Ingram (2018) has found significantly different impacts of gender on entrepreneurship with entrepreneurial activity highest for women when the entrepreneurial ecosystem features low barriers to entry, supportive government policy toward entrepreneurship, minimal commercial and legal infrastructure, and a normative culture that supports entrepreneurship. This is particularly pertinent in Thailand where women are disadvantaged in subtle ways by cultural norms (Mills, 1999).

4. Methodology

The present study drew on four data sources, literature and document review, key informant interviews (a total of 26 h), work life histories (a total of 15 h), and observations made in Bangkok and Chanthaburi in Thailand.

Literature on the gem industry in Thailand was collected from Thai government websites, such as the Thailand Board of Investment's review documents, and annual reviews and forecasts of the Thai coloured stone industry published by the GIT. All issues of the main trade journals for coloured gemstones, *InColor*, and the peak industry body, the Gemological Institute of America's quarterly journal, *Gems & Gemology*, were reviewed for work about sapphires. The history of the Thai sapphire industry was researched through primary and secondary sources, particularly the comprehensive studies by Chowdhury and Abid (2018); Hughes (1997, 2013, 2017) Hughes, 1997 Hughes (1997, 2013, 2017) Hughes, 1997 Hughes (1997, 2013, 2017); Scott (1994), and Shor (2013).

Key informants were sourced from the academic sector by the Head of Gemology at Kasetsart University and from the business sector including:

- Female traders at the JTC and the manager of the Asian Institute of Gemological Studies in Bangkok (interviews were conducted, recorded, and transcribed amounting to 26 h).
- Three female and one male academic at Bangkok and Chanthaburi universities along with an informal focus group of undergraduates (amounting to 12 h).
- Five female and one male employee of the GIT (amounting to 4 h).
- Nine female employees of large Thai gem and jewellery firms, including senior management (amounting to 10 h).

Life history questions (Giele and Elder, 1998) were used to open discussions with women working at universities, the GIT, as well as in large companies. This was followed by a series of specific questions for cutters and jewelers related to health and safety, knowledge transfer, and design, and for women business owners and leaders, on knowledge transfer, and design and leadership in the Thai industry.

Over extended visits, meals, and chats, detailed work life histories (Giele and Elder, 1998; Lawson, 2018) of four female-owned gem business owners

in the JTC were recorded, along with questions about their business, their products, how they learned their skills, design, leadership, the Thai industry, and opportunities for women. The stories of three among these four owners, who worked exclusively with coloured gemstones, were chosen and a narrative account was created. This was shared with the traders to check for accuracy; modifications were made where necessary.

Observations amounting to 26 h were conducted in Bangkok and Chanthaburi with the following: universities (3 h), GIT (3 h), gem and jewellery companies (9 h), JTC and markets (9 h), and sapphire mine (2 h). These were documented in the form of photographs and audio and video recordings.

All interviews were recorded, transcribed and printed. The analysis was iterative and informed by the literature from entrepreneurial ecosystems (notably Spigel (2017), Spigel and Harrison (2018), gender and entrepreneurship (notably Brush et al 2017) and the work of Mary Beth Mills (1999) on gendered division of labour in Thailand. In all of this I was mentored by key individuals in the industry who have supported my research over 12 months.

The printed transcripts were constantly re-examined and re-interrogated to refresh my understanding of who my interviewees were and how and why their action and experiences were significant in my understanding of women working in this industry

5. Thailand and its gem industry

Thailand is one of the most successful economies in Southeast Asia with its economic growth set to exceed 3.9% by the end of 2019 (Asia Development Bank, 2019). Although inequality between rich and poor is declining, the country still faces deep poverty in some areas (Asia Development Bank, 2019). Women's participation in the formal economy is 45.7%, which is higher than India and Sri Lanka, but lower than neighbours like Vietnam (World Bank, 2018a). Many Thai women complete university studies, in fact, more women than men, (Romanow (2012), and can have good positions and access to wealth. In a personal communication, Mills warns against concluding that this is a sign of gender equality in Thai society. Each workplace has its own hierarchy, which may not always support women and validate their experience. The introduction of industrial capitalism has meant large-scale factories with their own forms of gender segregation with different pay rates and fewer opportunities for advancement. Thailand has an informal workforce of 24.6 million (62.6%), making these workers major contributors in building the nation's economic capacity, albeit without the rights to occupational health and safety (Kongtip et al., 2015).

Alongside Sri Lanka and India, Thailand is one of the world's leading centers for gemstone and jewellery manufacture and export and it is Thailand's 5th largest industry (GIT, 2017). It has been the world's leading exporter of precious coloured gemstones for eight years (GIT, 2017) with overall exports in 2017 valued at 1.9 Billion USD an increase of 12.4% on previous years, the trend is particularly strong for polished stones, roughly half are sapphires (Shor, 2013) with export for polished sapphire up 17.6% (GIT, 2017). In 2017, the major export markets were the USA, India and Hong Kong (GIT, 2017). While most traders keep their export offices in Bangkok, the traditional center of the coloured stone industry and the place where much of the cutting is done, is Chanthaburi. This town of about 30,000 lies 150 miles southeast of Bangkok, near the old ruby and sapphire mining area of Pailin on the Cambodian border. The gem and jewellery industry employs 900,000 workers including 37,000 gem related business operators (stakeholder interview). The coloured stone cutting and polishing industry alone employs at least 20,000 workers in the formal sector (stakeholder interview; Richa G., personal communication, July 2019). However, given that two-thirds of the Thai population work in the informal sector (Kongtip et al., 2015), the total number of cutters and polishers is likely to be much higher with a high proportion of women in home-based work (HomeNet Thailand, 2012). These household industries are found across Thailand, in Bangkok or clustered near the gemstone-producing centers of Chanthaburi and Tak near the Myanmar border, but also in

northeastern areas of Chiang Mai and Kanchanaburi, which are currently important hubs of the country's gemstone processing (Cross et al., 2010). These small cottage industries are not regulated in terms of health and safety and wages are low due to piece pay (Cross et al., 2010; HomeNet Thailand, 2012). Thailand's success can be attributed to the skills of such workers, its history and geographic location, as well as to Thai institutions, both public and private, and the role of industry leaders, both male and female. We begin with a brief overview of Thailand's geography and history and then explore its institutions.

Thailand has been known since the 15th century as a source of corundum (Hughes, 1997, 2013, 2017). It is located close to major precious stone producing countries, such as Cambodia, Myanmar, Laos, Sri Lanka, and Vietnam. Today, Thailand's sapphire mines are largely depleted (Chowdhury and Abid, 2018; Hughes, 2017; Shor, 2013; Shor and Weldon, 2009) and the country must draw almost entirely on imported rough stones

to support its industry. Increasingly, it is sourcing stones from Africa through traders and Indian middlemen (stakeholder interview) or through direct purchase and ownership of mines, as is the case of Ilakaka in Madagascar. The present research found the GIT and large companies, particularly their female leadership, reaching out at government level to obtain concessions in gemstone-rich countries such as Mozambique (stakeholder interview; GIT News, 2018). The Thai gemstone industry has flourished also due to the skills of its craftsmen and women in both formal and informal sectors, a high level of professionalism particularly in the treatment of stones, intricate cutting and polishing, casting, molding, and gem-setting. Thai sapphire millionaires, for example, World Sapphires in Chanthaburi, have built their business on knowing just how to transform dull or dark corundum into fine coloured saleable sapphire using just the right heat treatment or by diffusion treatment using elements such as beryllium (stakeholder interview).



Fig. 1. Corundum producing localities of Thailand, Western Cambodia and Laos.

Source: Reproduced here with the permission of Lotus Gemology Co. Ltd, © 2018.

6. Women in the Thai gemstone value chain

Active Thai mining is now limited. Most women working in the industry cut and polish gems or make jewellery, with many female cutters operating in the informal sector as home workers (Thai Labor Campaign in [Cross et al., 2010](#)). There are no gender disaggregated official statistics on the number of women working in the industry and owning businesses (stakeholder interview), but it is estimated that nearly half of the total 60,000 workers in the informal gem-cutting sector are women. Women working at home are typically paid by piece. They cut about 100 stones a day making about USD 4 per day ([HomeNet Thailand, 2012](#)). Without any financial support they buy their own equipment and often pay for their own transport once a week to pick up and deliver stones. They are excluded from any opportunities downstream, such as stone-setting or jewellery-making. They work for business people who are often not registered, so they cannot access government benefits such as occupational health and safety schemes or any type of paid leave. They often work long hours without any personal protective equipment and report backaches and eye problems ([HomeNet Thailand, 2012](#)). Their work is not well defined in terms of expectations and standards, which means they can also be subjected to bullying and exploitation by their male employers. In rural areas it is not uncommon to combine lapidary with agricultural activity such as rice growing and to work as a family unit where they can learn the trade from each other.

Women are also engaged in cutting and polishing in the formal sector in small factories, or large manufacturing jewelers like Pranda where 60%–70% of its 4000 employees are women, and Mona, a manufacturer of silver jewellery, where 80% of its 70 staff are women (stakeholder interview).

Although the number of women working in factories can be greater than that of men, the type of work they do differs, and there is evidence of gender stereotyping of labor and pressure to conform to idealized and limiting norms of femininity in some settings. Men do the cutting of heavy rough stone, women carry out preforming at the initial stages, simple cuts and cabochons, and then quality control of the final product. However, in many factories the higher paid skilful cutting and finishing is done by men. In jewellery manufacture, men tend to make molds, do heavy casting, and are more involved in machine work; women do wax injecting, pre-finishing, filing, and plating. Cultural stereotyping can prevent trained female metal smiths from carrying out heavier aspects of metal smithing because of fear of damaging their skin.

Both men and women work in the highly skilled area of stone setting. They are jointly involved in designing and Thailand has a number of award-winning female jewellery designers, such as Nimmawadee Krainara. In fact, Silpakorn University runs prestigious graduate and postgraduate degree programs in jewellery design. Many women study gemmology and some become teachers, others work in gem-identification labs. Fewer men work in these labs because, according to one source, men prefer to own their factory or be in management: “It doesn’t mean that women can’t do this, but there are more men because when women are married they have double work and I think women feel they are lower than men.”

7. Thai public and private institutions

The Thai gemstone entrepreneurial ecosystem is greatly assisted by its institutions.

The GIT was created by Royal Decree to provide leadership, create standards, and ensure quality in the industry, to respond to industry needs and to act as a clearinghouse for information on the Thai industry. It also conducts research and training to develop the industry and train personnel in all aspects of gemmology and jewellery design.

Currently, the GIT’s main aim is to support the government’s objective for Thailand to become “the world’s top gem center in the next five years” (stakeholder interview). The GIT employs many women as teachers and gemmologists, and the interviews made it clear that they were satisfied working in the gem laboratories. One respondent notes: “Mostly I work with corundum from Madagascar I can see this from platelet inclusions and then check chemical composition” (stakeholder interview).

8. Thai government in the entrepreneurial ecosystem

The government through the Board of Investment of Thailand and the Industrial Estate Authority of Thailand plays an important role in the entrepreneurial ecosystem. In 2018 it announced its ‘resolute support’ for the sector with a series of measure to promote growth in the sector ([GIT, 2018](#)). These include promotion and trade fairs, tax exemption on wages, imported gems and jewellery, rough stones and precious metal, a significant decision since Thailand is heavily dependent on imported stones and machinery. There are also deductions on wages and salary for those in the trade and low-rate loans for machinery upgrades for small and medium-sized enterprises. The initiative specifically addresses training and skill classifications at all stages of gem processing aiming to improve conditions for, and retention of, Thailand’s skilled crafts people using, for example, the e-expert system to attract highly skilled gem and jewellery professionals from outside the country ([GIT, 2018](#)).

Special economic zones close to gem sources on the borders of Cambodia and Myanmar specifically target the gem and jewellery industry. Gemopolis, a light industrial park in Bangkok, is a tax-free zone, and has already become a manufacturing base for many gem and jewellery companies ([GIT, 2018](#)). There is, however, no specific mention of entrepreneurial development or women in these initiatives.

9. Publically funded universities teaching gemmology

Thailand has a proud tradition of public higher education with a total of 171 universities and colleges enrolling over 2 million students in 2016 ([Buasuwan, 2018](#)). Higher education will play a crucial role as Thailand seeks to transform itself into a high-income knowledge economy based on creativity and innovation and the development of new technologies as articulated in the government’s Thailand 4.0 vision ([Buasuwan, 2018](#)).

Six of Thailand’s major public autonomous universities have undergraduate to doctorate-level degrees in gemmology. The low fee structure permits a wide range of students including many young women to have in-depth understanding of the industry ([Table 1](#)). Thai scholars, including a notable group of women or “lady scientists” as they are colloquially known, have become world-leading experts on gemmology and heat treatment of corundum and Malagasy sapphires in particular. These women are global leaders and provide expert technical advice to the GIT (stakeholder interview). See, for example, [Phlayrahan et al. \(2019\)](#).

There are also many private-fee-paying institutions offering short courses with international accreditation, such as those by the Gemological Institute of America (GIA), the Gemmological Association of Great Britain (Gem-A), and the Asian Institute of Gemological Sciences (AIGS). The AIGS, the first in Thailand, was established by the Sino-Myanmar-Thai Ho family and is today located within the JTC, it also provides training and gemstone certification services.

10. Cultural and social aspects of the Thai gemstone ecosystem

The Thai gemstone entrepreneurial ecosystem has many highly skilled workers, working in some 37,000 gem related businesses (stakeholder interview). Cultural and social attributes play an important part in defining the role of women, particularly in leadership. The Thai

Table 1
Gemmological education at major public autonomous universities in Thailand.
Source: Author.

Institute	Course	Comments
Srinakharinwirot University, Bangkok	Year-round undergraduate program in gemmology and lapidary, design, and business	The first university to offer formal degree course in gemmology in 1992
Chiang Mai University, Thailand	Bachelor of Science in Gemmology; also postgraduate/PhD courses	The specialty of the Faculty of Science is gemmology and treatments
Silpakorn University, Bangkok	Undergraduate and postgraduate courses in jewellery design	Special course on Jewellery Design by the Faculty of Decorative Arts, set up in 1956
Burapha University, Chonburi	Year-round undergraduate program in gemmology and lapidary, design, and business	Courses offered by the Faculty of Gems
Rambhai Barni Rajabhat University, Chanthaburi	Year-round undergraduate program in gemmology and lapidary, design, and business	Courses offered by the Faculty of Gemmological Sciences and Applied Art
Kasetsart University, Bangkok	Undergraduate and postgraduate programs on on Gems and Jewellery at the Department of Earth Science are optional subjects	Doctoral research center with leading scholars and community gemmology outreach in Phrae

gem and jewellery industry is controlled largely by Sino-Thai families (Hughes, 2017) and while a male heir is preferred, this does not stop women from taking leadership roles. One such example is the daughter of an established Sino-Thai gold trading family who now owns Mona, a major firm making silver jewellery for clients in Europe and the US and employing 70 women.

The strength of the family and family entrepreneurship in Thailand is clear and there is a desire to do good and leave behind a positive legacy. This is well-illustrated in the following narrative of one of Thailand's leading business women, who, together with her family, controls a business which works across the entire jewellery value chain—purchasing rough stone, cutting and polishing stone, setting, and manufacturing jewellery to be sold globally. As she says, “We can tell the story that from natural resources we can create something beautiful.” (stakeholder interview). Out of respect for our interviewees’ anonymity, all names have been removed from this interview.

11. A leading business woman

X is the deputy president of a leading jewellery manufacturer in Thailand, and is one of the five senior women who sit on the board of this prestigious firm. She is an active member of the Thai Chamber of Commerce and government bodies such as the GIT. Of the 700 workers who work for her, 60% to 70% are women: “You can put more women in work than men,” as she says. Women work in almost all areas including workshop management and sophisticated cutting, and are especially good at pre-finishing and fine delicate work, plating, and quality control, while men tend to do heavy machine work, making molds and cutting stones. About 60% of her designers are women but she mentions there is “talent in both sexes.” Every year she and her company sponsor 150 young women from the northeast and hill tribe areas, a 3-year diploma program which is part of the Thai Royal Princess program, her company provides pastoral care and the education for the enrolled students. At the end of the program as many as 70% are retained as skilled workers at the company. Care has been taken to make the factory an attractive place to work with plants on the benches, music, and exercise. There is also a crèche, accommodation for the workers, health insurance, and incentives for long service. More than half the staff have worked there for over 10 years. For example, N comes from Bangkok and has been working in stone-setting for 30 years, since the age of fifteen. Today, she is one of the three stone-setting workshop supervisors, the other two being male. She says, “Men are equal to women, for example, we are all supervisors. It can be a difficult job, but I will teach them. I am very proud to have been able to support my family through my job.”

Another example of an entrepreneurial Sino-Thai family is the Ho

family. Originally from South China via the ruby fields of Myanmar, the Ho family established the Thai Gem and Jewellery Traders Association and with Bijoux Holdings created Asia's largest gems and jewellery marketplace, the JTC, a 59 story building in the heart of the gem district dedicated to gems and jewellery. The JTC functions as a hub, a cluster and one stop shop for sellers and buyers of wide range of precious and semi-precious stones and a gem certification centre, (AIGS Thailand). Although not characterized by female leadership, their company with its investment capital and deal-making, have facilitated female entrepreneurship in the JTS, and two women are listed on the executive management team. The JTC is certainly a material attribute of the Thai gem ecosystem, but it also facilitates a process of social and cultural exchange with its remarkable international melting pot of traders, Thai, Indian, Sri Lankan, and a wide range of African nationals selling rough stone. On its doorstep, at the Starbucks coffeehouse, African gem dealers meet. Predominantly Guinean, but also Nigerian, Senegalese, Malagasy, and Congolese, mostly men but some women, they are an essential part of the ecosystem, and the Thai industry needs their stones. There are 300 registered traders within the center and Henry Ho estimates that at least 1000 women are employed in various roles (personal communication, 2019). At least 18 women are listed on the individual trader's website.

The following section narrates the stories of three female traders in the JTC collected over a week spent observing and interviewing them.

12. Women gem traders at the JTC

Three established female traders have been working in the JTC ranging from 5 to 10 years. They have set up small shops or booths to facilitate business. They have more than 20 years' experience in the gem trade. To protect their anonymity, their names and their company names have not been used.

12.1. Y gems

Y sells jade, unheated ruby and sapphire, and traditional or antique jewellery. She studied chemistry and started selling gemstones to supplement her income. Her aunt taught her about the gem business, taking her to the Myanmar border and introducing her to ruby wholesalers, teaching her about selling her medium stock, but to keep “the more expensive for a special day.” She took advantage of cheap labor to make yellow-gold settings for the ruby and sapphire she bought. At first she sold only wholesale to Thai customers and to antique shops specializing in traditional Thai styles; but fashions changed and these shops have since shut down. Five years ago, she opened her shop in the basement of the JTC. She now sells from her collection and buys from other wholesalers. She has an eye for the beautiful and the original, and knows her customers well.

12.2. *T gems*

T Gems specializes in selling good quality large sapphire, emerald, and ruby. The owner comes from a Sri Lankan gemstone trading family, but became interested in the business after her marriage to an American mining engineer working in Sri Lanka. “He encouraged me into the business and we had a partnership.” They opened their first lapidary store in Sri Lanka employing 350 workers, including many women engaged in processing (cutting, polishing, and heating) sapphire, including Australian sapphire, as well as stones from their own river mine. Following the onset of civil war in Sri Lanka, they settled in the USA where she worked in a chain of jewellery shops until her husband’s untimely death stopped her work for three years. Encouraged by the Ho family, she studied gemmology and picked up the trade again by starting a lapidary workshop in Sri Lanka. She moved to Thailand seven years ago and set up T Gems.

12.3. *Z gems*

Originally a banker, the owner of this company was one of the first to rent a booth in the JTC. She specializes in unheated exquisite coloured stones. Her sister was a diamond trader and Z first completed a module on diamond grading with the GIA’s training center in Bangkok, but was quickly drawn to the vibrancy of coloured gemstones. “I switched to coloured stones without knowing that not many women are doing this alone as usually it is a family business or they are helping their husband. But I started alone and I said I was lucky as I had already established some contacts abroad.” She faced hardships in her early days. It was not safe to travel to the mines and she remembers people asking “Who is that woman?”. “They didn’t trust me and the Indians laughed at me. My small booth looked awful.” This all changed when one day a Chanthaburi merchant agreed to sell her stones. Her business now has an excellent established network of suppliers and customer of exquisite stones.

13. Discussion

The entrepreneurial ecosystem in Thailand has been an enabler as well as sometimes acted as a hindrance for female academics and gemmologists, for cutters and polishers in the formal and informal sectors, and for women in the business of selling cut stones. Enabling factors and the hindrances are discussed for each group along with their contribution to the industry.

13.1. *Lady scientists and female gemmologists*

The Thai university system has been an enabling force, empowering many women working in this field. Lady scientists and female gemmologists are trained under a public university education system that provides specialist education in gemmological science across Thailand. A number of the women interviewed had studied to a PhD level. They are outstanding scholars and have had opportunities to study abroad and even publish; they presently engage in actively mentoring the next generation of female scholars and seem to have support from the academic hierarchy. One woman says, “One thing that is good about Thai universities is that the Dean always considers you as a professor. I feel warm at heart. Here, they support me and because of this, I have been able to grow.”

There is also a tight knit community of practice among these women and their male colleagues with clear examples of mentoring, leadership, and friendship; this has enabled many lady scientists to succeed in the industry and to provide authoritative leadership. At least two directors of the GIT have been women. Others find fulfilling work in gem identification labs, which are an important part of the gem industry providing professional reassurance for buyers about the identity of their stones. However one undergraduate program leader, stressed that all

her graduates would need further training and work experience preferably in a foreign owned lab in order to get a good job. Despite well-equipped facilities and a good program, training received with prestigious bodies such as the GIA is still extremely important for the next generation of workers in this competitive industry.

13.2. *Female cutters, polishers, and jewellery-makers*

Female stonecutters and polishers as well as jewellery-makers are a significant part of this ecosystem. In the formal sector, those working in large companies in Thailand, such as Pranda and Mona, have the benefit of working at an attractive workplace with childcare facilities. Pranda provides accommodation, health insurance, and incentives for long service. There is also an opportunity for women to develop new skills and female role models are provided by senior leadership and supervisors at both these companies. Even with all this, however, there is evidence of persistent economic disincentives for female cutters linked to limitations placed upon women’s work. Women at one large Chanthaburi factory are only engaged in preforming and grading of stones, while the more sophisticated, better-paid cutting tasks are performed by men.

There is stark contrast between the majority of female cutters working in the informal sector and those in the formal sector. Women in the informal sector miss out on basic benefits such as social protection, maternity and sick leave, they are not provided with personal protective equipment, and suffer from health ailments such as eyes and back problems (Cross et al., 2010; HomeNet Thailand, 2012). While for some the opportunity to work at home and combine this livelihood with other activities like farming may be an incentive, for other women they only accept this very small piece pay for their labor because they are poor. “[W]e cannot stop cutting stones, it is the only skill we have” (Cross et al., 2010). Women in this sector provide a huge flow of cheap gemstones to the industry close to the trading areas; their work needs to be recognized and regulated. A case study by Home Net Thailand suggests that up to 100 stones a day are cut – further research is needed to confirm this (HomeNet Thailand, 2012).

13.3. *Women traders at the JTC*

The women traders in the JTC have all been enabled by their professional backgrounds, their family connections to the gem trade, and training courses in gemmology offered in Bangkok. One trader mentioned benefiting from tax benefits for the industry, but it is really the JTC, a thriving international one-stop shop for gems and jewellery, which has provided them with a unique opportunity to establish themselves in a dynamic environment with many networking opportunities and access to both commercial buyers and sellers and the tourist and retail market. In contrast to the monochrome sales rooms of the male traders, the women’s shops are vibrant and individual, reflecting their passion for the industry.

As with most female entrepreneurs, their stories are interwoven with strong informal institutions of family and friends and the knowledge that accompanies this (Stead, 2017): the rich heritage of a Sri Lankan gem-trading family, marriage to an American mining engineer, a sister in the diamond trade, a gem-trading aunt in Mae Sot on the Myanmar border. While not part of the elite, they are women who have had opportunities, training, and family support, and have used these to create successful businesses. Two of the traders mention friendship and mentoring from the Ho family as significant in their work life history, such mentoring is a strong attribute of a successful entrepreneurial ecosystem.

Hechavarria and Ingram’s (2018) global research has found that cultural forces can also negatively impact women’s entrepreneurial intentions; there can be an “invisible masculinity” (Ahl, 2006) associated with entrepreneurship such that women are deemed unsuitable as entrepreneurs in some cultures (Gupta et al., 2009). Z’s story has a

number of examples of these sexist views of women in business. Z's inner resilience enabled her to rise above these views but such male attitudes and ongoing pressure on unsupported workers can sap a woman's confidence and her entrepreneurial intentions. An example is when women gemmologists told us that their male colleagues were more likely to branch out and own their own gem factories and labs. When asked why this was the case, they told us "because when women are married they have double work and I think women feel lower than men".

14. Conclusion

The study in this paper reflects on the changing nature of the gem industry in Thailand, a mature industry which must now seek far and wide across mineral tracts of the world to find suppliers in a highly globalized industry. The driver of the industry can no longer be its regional proximity to gemstone sources; it must rely on developing linkages, local and global, between its institutions of education, government, and successful private business and above all investing in its people. We have considered the role of women in the industry, their contributions, and factors that facilitate or prohibit their full participation. Compared to the gem industry hubs of India and Sri Lanka, Thai women play a far more active and vital role in the industry as leaders, academics, traders, and as dedicated and skilled workers in the formal and informal cutting and jewellery-making sector. Women head up some of Thailand's most prestigious gem and jewellery businesses and have made a difference in other women's lives through leadership, mentoring, family-friendly workplaces, and even schemes to benefit rural women. Both academic and businesswomen have provided leadership to institutions like the GIT, thus fostering growth in the entrepreneurial ecosystem. We have also seen challenges women face as they encounter the "invisible masculinity" (Ahl, 2006) associated with women's entrepreneurship in this industry and in the less-well-paid cutting work that women find themselves doing.

While honouring these women's contribution to the industry through their meticulous preforming, cutting and polishing and grading of stones, it is time for such women to participate more fully in its economic benefits. This is especially true in the case of the thousands of women working in the informal sector, at home or in small shops. Future research should work with organizations like HomeNet to better understand women's work in the informal sector and to find ways for them to be connected with the country's educational and entrepreneurial initiatives for the sector.

Many women in the gem and jewellery industry in Thailand are highly educated, there are skilled and creative designers that draw on a centuries-long history of decorative arts and craft. This paper strongly encourages measures that will connect women and men, particularly young women graduates and designers, as fresh voices and creative forces and significant new resources, to the Thai gemstone entrepreneurial ecosystem. Explicit teaching of entrepreneurial skills, mentoring, networking events and incubators are needed to propel the current gemstone ecosystem to a new level. This will be essential if Thailand is to be successful in reaching its goal of becoming the world's gem and jewellery hub (GIT, 2018) in the next five years. Thailand needs to make sure its university courses in gemmology and lapidary, design and business provide graduates, both male and female, with the highest possible level of skill for the industry.

The young female students we met at Bhurapa University Faculty of Gems in Chanthaburi were brimming with enthusiasm for the course they were studying and wished to contribute to Thailand's vision of becoming a global hub in the industry. As one female undergraduate student, commented: "*Thailand needs us. New stones are hard to find we need to create new materials and treatments. I think design is amazing and beauty is so important for humans*". The Thai gemstone entrepreneurial ecosystem can only be richer for listening to such voices.

Acknowledgements

The author is grateful for the assistance and advice from Dr Pornsawat Wathanakul, Mrs Prapee Sorakraikitikul, Dr Malin Sawatekitithum, Dr Surin Intayot, Mr Henry Ho, Mrs Barbara Wheat, and Miss Nimmawadee Krainara.

The author also gratefully acknowledges support received from the Tiffany and Co Foundation through the Gemstones and Sustainable Knowledge Hub at the University of Delaware.

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