

A method to certify Fair Trade Software practices

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Abstract. The last two decades, the software industry has experienced a steady trend towards globalisation. Outsourcing and offshoring software development entails numerous challenges. This paper reviews the literature showing that most of the reported challenges focus on the economic dimension; that is, factors that threaten productivity and benefits. The social and environmental dimensions have been marginally investigated. To cover that gap, we have conducted a case study on the Fair Trade Software Foundation, thoroughly investigating its underlying principles. This has revealed the need for a method to assess the extent to which the practices of the member companies of the FTSF are indeed fair. We have designed such a method, supported it with a socio-environmental auditing tool and validated it with experts. It has undergone two iterations. We expect that these contributions will help information technology companies continuously improve their Fair Trade Software practices.

Keywords: Fair Trade Software, Socio-Environmental Auditing, Software development supply chain, IT Outsourcing, Sustainable IT

1 Introduction

Ever since Kodak outsourced their information technology (IT) functions in 1989 [4], other organisations followed in their footsteps and caused a rapid expansion of supply chains. The outsourcing of IT consequently became a huge trend in the software development industry [14]. If executed properly, the outsourcing of IT to a developing country promised a lot of benefits for organisations established in developed countries. According to Mikita and DeHondt [27], examples of such benefits are lower costs, company growth, a gain in efficiency and access to a higher level of experience and knowledge. With the growing need for experts in the IT sector and an increasing importance of technology, costs are also climbing. Although this could give the impression that outsourcing is an easy decision, this practice has proved to be full of challenges related to productivity [27]. Also, the economic growth for an organisation does not ensure an equal benefit to the social and environmental dimensions of the Triple Bottom Line (TBL) [17], a framework used by some organisations to assess performance on

a broader perspective according to its three dimensions: social, environmental, and economic.

Nowadays, Fair Trade is a well-known concept which is mainly focused on agricultural and craft commodities in developing countries and is known for addressing all three aforementioned dimensions. Examples of companies adhered to Fair Trade principles are *Tony's Chocolonely* and *Max Havelaar*. Although Fair Trade has its advantages, such as promoting the welfare of farmers and producers in developing countries [28], it also goes accompanied with disadvantages. An example of such a disadvantage can be found in the Fair Trade coffee market in Nicaragua, where an oversupply of Fair Trade coffee can act as a barrier to entry for small coffee producers, further inhibiting potential Fair Trade benefits [37].

Despite Fair Trade's success in the aforementioned areas, the concept has not yet translated well to service-oriented industries, such as the software development industry [19]. Fair Trade Software (FTS) is a new take on the concept of Fair Trade. It is an economic model that aims to "deliver high quality and cost-effective software for corporate customers while simultaneously helping to grow knowledge economies in developing countries" [20]. Haxby and van Weperen report that even though the IT market is growing in developing countries, it is still limited. Large IT projects in developing countries have to be outsourced to foreign suppliers in developed countries because the local companies do not have the managerial nor the technical skills to deal with the complexity. This results in an unfair balance of local IT companies working on small scaled, low-value software products while the clients in those countries rely on importing high-value foreign IT products [20]. The Fair Trade Software Foundation (FTSF) was founded to break this cycle of having to export low-value goods and import high-value IT services. FTSF acts as an audit and accreditation body for the companies that are willing to create shared value by adopting Fair Trade Software practices. That is; creating economic value in a way that also creates value for society [24], where distributed teams collaborate to develop high-quality software, regardless of the geographical location. A project is considered as Fair Trade Software if it is created through cooperation between a member in an OECD country and an IT company in a developing country. Ever since the creation of FTS in 2011, the FTSF has overseen multiple successful projects in Kenya, such as CodePamoja (translates to "Code Together" in Kiswahili), a training program which trains young IT-graduates and gives them opportunities to gain work experience by participating in real software development projects in cooperation with a Dutch organisation [7]. Another example of a successful collaboration is with Barclays Bank Kenya. They created a mobile CRM system that enables micro-finance for people in rural areas in Kenya by providing them with bank accounts. Due to its success, the application is expected to be implemented in nine more African countries in the near future [7].

Fair Trade Software is a young concept that is not yet well-known throughout the software development industry, but it is a promising movement towards more growth and opportunity in the IT sector in developing countries. If the initiative

gets traction among software development companies, some critical issues will be how to determine whether a candidate company deserves to be certified as a Fair Trade Software company, assessing whether a current Fair Trade Software company deserves having the certification renewed, and ascertaining the extent to which it is increasingly improving the fairness of their practices over the years. The main research question in our research is the following: how can the fairness of software development practices be assessed with the aim of supporting certification and continuous improvement processes?

The main goal of this paper is to design a certification method using a set of sustainability indicators. Companies that are willing to join the FTTSF can use this method and its indicators during their application process to gain accreditation. Additionally, with the help of this method, certified members will be able to assess how they score on a set of sustainability indicators and improve on these areas each year. The method will define when to measure and gather evidence, provide guidance on how to do it and with what tools, and how to analyse and report the results. In principle, any company involved in global software development could apply our method, if they are interested in increasingly improving their sustainability and business ethics, even if they do not belong to the FTTSF.

The contributions of this work are (1) a list of the key ethical challenges of software industry supply chains, according to the literature, and (2) a method to certify members of the FTTSF and identify areas for improvement in the ethics of their practices, along with the file that configures a socio-environmental auditing tool so it supports this method.

The rest of this paper is organized as follows. Section 2 describes the details of the research method. Section 3 investigates the current situation of supply chains in the software industry, its challenges and the structure of the FTTSF and how they address the challenges. In section 4 we define sustainability indicators and the method. Section 5 presents the validation of the designed method. Lastly, section 6 will conclude the paper and provide directions for future research to either improve our method or improve FTS practices in general.

2 Research Method

Based on the goal of this paper, five research questions were formulated. Three of these research questions are knowledge questions (*R1*, *R2*, *R5*), where literature research is done, sources are investigated to establish more knowledge, and interviews are conducted for validation. The other two research questions are practical questions (*R3*, *R4*), where information is gathered to identify sustainability indicators and to design the method.

- **RQ1:** What are the current challenges in software development supply chains and what does the FTTSF propose to address these?

Before investigating what fairness means in the software development industry supply chains, it is necessary to identify what are the current ethical challenges that have been reported to affect the most vulnerable members of those supply chains.

- **RQ2:** What are the current fair practices of companies following the FTS principles and what is the space for improvement?
Before defining sustainability indicators, it is important to investigate what fairness means in the context of Fair Trade Software and in what areas improvements can be made.
- **RQ3:** What are the relevant sustainability areas and indicators to the software industry?
To define a certification method, it is important to first establish a set of sustainability indicators upon which an organisation can be assessed by the FTSE. This is done by identifying several areas of sustainability and business ethics.
- **RQ4:** How to gather evidence to assess the fairness of the supply chain and the compliance with FTS principles, as well as to define improvement actions for an organisation’s FTS practices?
By using the accumulated knowledge of the previous research questions, a certification method can be defined for the FTSE.
- **RQ5:** What are benefits and drawbacks of applying the certification method to an organisation accredited by the FTSE?
By reflecting on the benefits and drawbacks of the certification method with the help of the FTSE, the method can be validated and altered to ensure it is relevant and usable for the FTSE.

To answer these research questions, the following research method was structured by applying Design Science as proposed by Wieringa [41]. Figure 5 in Appendix A also depicts the research method in a Process Deliverable Diagram (PDD), designed as proposed by van de Weerd & Brinkkemper [38].

We first had to analyse the current situation of supply chains in the software industry so it could be compared with the standards of the FTSE. This has been undertaken as a systematic literature review, as proposed in the guidelines of Kitchenham [23].

For a sound generalisation of the challenges within these supply chains, we established the scope of a software development supply chain as: All entities that have an interest in the successful development of a software product or service, which would include the product development organisations and their direct suppliers as well as possible prime contractors/clients in the case of custom-developed software.

The search for this systematic review was conducted with Google Scholar and Scopus. At first, we searched with the obvious term: *Challenges in software supply chain*. Because of a lack of relevant results, we applied a unified search term to both databases: *((challenges OR issues OR risks) AND (software OR it OR software development) AND (outsourcing OR offshoring OR supply chain))*. Both search terms were used, as the unified search term did not come up with some of the papers we found during the initial search. Then, to ensure a not too broad inclusion, the following criteria were adopted to select relevant papers:

1. Publications should be English or Dutch.

2. They have to list some risk/challenge concerning either the software development supply chain or outsourcing/offshoring.
3. Research must have been conducted after 2000. Even though the outsourcing of IT dates back to the early 90s, the year 2000 was chosen as a criterion to ensure we find relevant challenges that still apply to the modern software supply chains.

The search on Google Scholar yielded too many publications to read everything, so the first 300 were considered. By just reading titles and abstracts if the title was not self-explanatory, 284 publications were removed as they did not meet the second criteria of mentioning risks/challenges concerning the *software development* supply chain. Then another 4 were removed as those were studies conducted before the year 2000, which left us with 12 relevant papers found. Searching on Scopus yielded 288 results. Around 248 of these results were excluded after just reading their titles, as most again did not mention any challenges or risks regarding the software supply chain specifically. After reading the abstracts and some conclusions of the remaining 40 publications, 11 were deemed relevant for our research. Combined with two publications released on the official website of the FTSE, a total of 25 publications were found after the search, which is shown in Table 11 in Appendix C. We performed qualitative data analysis over the selected papers, supporting it with the tool NVivo [40]. The taxonomy of nodes used to code the papers was built incrementally, as a result of several discussions between the author and supervisors. The challenges were listed in a table and briefly explained.

To find out how the FTSE proposes to address challenges in the global software development industry, we have analysed their principles and standards, which were outdated at the time of this research but still maintain the values the FTSE represent. The FTSE created two sets of standards to enforce the principles, one for Provider companies (PR) and one for Partner companies (PA). Unfortunately, these standards are not publicly available anymore as of 2018, due to an update of the FTSE website. These standards are composed out of minimum requirements an organisation has to follow to gain FTSE accreditation. Out of these two standards, we deduced 30 requirements and referred to the corresponding standard in FTSE's documentation. This table also includes the challenge that is addressed by that requirement. These requirements were then linked to the 10 established principles, to gain concrete knowledge into what is needed to follow FTS practices. Then, the standards were used to assess how the challenges in the software supply chain are either partly or completely resolved. The PDD of Appendix A includes the data model relating these concepts to one another. Challenges that are not or partly resolved with these standards help to identify the space for improvement. Apart from listing the challenges found in literature, we also added challenges that the FTSE addresses with their principles, but were not mentioned in our literature research. Lastly, the principles, requirements, membership grades and the accreditation process are revised to match the current vision of the FTSE and adjusted accordingly.

To investigate the Fair Trade Software Foundation and how accredited entities ensure they comply with their standards, a case study has been done of an organisation directly involved with the FTSF. This is a company that has been strongly advocating the concept of Fair Trade Software. We conducted semi-structured interviews with representatives of the organisation, whom were willing to talk to us about their Fair Trade Software practices and the development of this method. The representatives were assured both individual as organisational confidentiality.

To elicit the information, we interviewed personnel about several aspects concerning the FTSF, categorised as seen in Appendix E. The questions seen there were used as guidelines and the actual interview was not structured as such, due to the discovery most of the information was outdated. With their consent, we recorded the conversation and made concise notes on their answers during the interview.

The interview was analysed by transcribing the recorded conversation in NVivo for a complete overview of the questions and their answers. As a result of the interview, the structure of this paper had to be changed. Existing tables for principles, challenges, and requirements were updated, and comparisons were made between different versions of the FTSF. Then, a table was created indicating the areas that require improvement and how these areas could be improved, including those found in the literature.

Sustainability indicators have to be identified for the method by merging information from several sources. The sources we use are our own input, the FTSF's application form, their standards, and existing socio-environmental auditing (SEA) methods. The indicators are classified by both the FTS principles and the dimensions of the TBL model. These dimensions are then double checked by comparing the classification with classifications of existing SEA methods.

Then, to define the method, an elaborate BPMN was created using Lucid-chart. This model will explain what activities, inputs, and outputs are present in the proposed method. All activities will be briefly explained, to create a better understanding. The instruments for measuring and the dashboard to present the results are also discussed and explained. Another good candidate modeling language to specify the method with is PDD. However, we require a language that facilitates the communication with the FTSF members, as they are familiar with BPMN. Also, the process part of the method involves an intertwined collaboration between several parties, which can be easily represented in BPMN.

Lastly, an Expert Assessment is conducted for validation of the proposed method. The protocol for this assessment can be found in Appendix J. This is done during a meeting with representatives of the Fair Trade Software Foundation. Follow-up validation is done by exchanging emails with the same experts. A validation matrix is constructed to indicate the changes in the method, as described by Deneckre et al. [12].

3 Investigating the current situation of supply chains in the software industry from an ethical perspective

Supply chains are often thought about as the creation and delivery of physical items, but in our case, we are focusing on the supply chains in the software industry, which primarily does not involve physical items.

3.1 Ethical challenges in the software industry supply chain

Using NVivo, the literature was analysed and references to similar challenges were listed in their respective nodes. The following intertwined challenges were identified as a result, of which full descriptions can be found in Appendix D. As seen in Table 5, most reported challenges affect the economic dimension of the Triple Bottom Line model, which makes sense as most organisations are driven to solve issues that influence their financial assets.

CH1. Managing security and access privileges The most frequently reported challenge within software supply chains was about the barriers of security and access privileges and the importance of Supply Chain Risk Management (SCRM) [22]. With products not being physical in the software supply chain, the use of internet poses a greater threat to the security of these products than in traditional supply chains [8]. Aside from the protection of intellectual property, it is also very challenging to protect individuals within organisations in larger supply chains [5]. The privacy and personal data of employees are at risk without the use of adequate security measures, even though these employees have little to no influence on the important business decisions made on security.

CH2. Overcoming teamwork difficulties One frequently occurring issue was the complexity of teamwork along the supply chain. Due to the short lifespan of IT projects, employees often face difficulties in developing social bonds and linking their personal goals to those of their team members [2]. On top of that, the differences in educational backgrounds create knowledge gaps, which affects the quality of knowledge-sharing between employees within a team [45].

CH3. Cultural and societal differences Another challenge, related to teamwork difficulties, are the barriers formed by cultural and societal differences [13]. With an extending supply chain due to outsourcing, employees face barriers as they can encounter several cultural and lingual differences [45]. These barriers complicate the process of sharing and absorbing knowledge for all involved parties. Other than a difference in language, differences in attitude towards hierarchy, time management, and risk avoidance can also create confusion amongst employees [10].

CH4. Reducing lack of management and technical skills Even though developing countries such as Kenya have seen a growing trend of well educated young people, there is still a lack of employment opportunities [19]. Apart from technical knowledge, professional skills such as project management techniques are now also required to work in IT [42]. Even countries with a relatively more developed IT market face the issues of this perceived lack of skills and experience [34].

CH5. Stimulating domestic market development Just as the careers and skills of individuals in developing countries are limited, the overall domestic IT market development suffers of the same issue [20]. Companies in Kenya are often excluded from large IT projects and have to settle for smaller, low-value projects, due to the perceived lack of capabilities [19]. Companies in India also face challenges as their underdeveloped domestic market hinders the development of stronger innovation capabilities [34] [26].

CH6. Hidden costs Because of the rapid growth of technology, software products tend to become obsolete much sooner than products do in traditional supply chains and requires firms to regularly update or replace their products [8]. Also, software products are bound to have bugs and quality issues, which in turn causes an increase in costs for testing procedures. Additionally, outsourcing, although its primary reason is the reduction of costs [18], comes accompanied with hidden costs for security, protection of intellectual property and legal costs due to conflicting regulations and practices [5].

CH7. Prevention of health issues Although there are no official documented studies, anecdotal evidence suggests that burnouts, stress and, other health issues have been affecting the IT industry in India [2]. This is enough for us to stress the importance of arranging safe, healthy working environments for all employees of any organisation.

Apart from these 7 challenges found in the literature, the principles of the Fair Trade Software Foundation (Table 4) also suggest some possible challenges. A regular literature review was conducted to find evidence and three additional challenges were listed.

CH8. Respect for the environment Remarkably, none of the found publications are related to the environmental impact of IT. It is safe to say that the software supply chain has a relatively lower impact on the environment than traditional supply chains, as most products are not physical and require no transportation and raw materials. Nonetheless, it is important that organisations pay attention to environmental matters such as resources consumption, hardware disposal, and carbon emission during manufacturing, as these factors do contribute to the environmental impact of IT companies [44].

CH9. Removing forced labour and child labour There is little evidence of child labour within the IT industry. One of the most important causes of child labour is poverty. Unfortunately, child labour deprives the children of schooling and the acquisition of professional skills, which ultimately does not stimulate the poverty rates and can create a deadlock [32]. Biao states that some middle- and small-sized IT companies in Andhra Pradesh, India, hired children to serve tea, mop floors and buy lunch [6], but as this research was done over a decade ago, it is difficult to assess the current severity of child labour in global software development.

CH10. Commitment to non-discrimination and gender equity Although the participation of women in the IT sector has been growing in the past decades, there is still an under-representation of females in both education and in the workforces [30]. Just as the Fair Trade Software Foundation, we be-

lieve it to be important that organisations commit to achieving gender equity by establishing policies that take diversity into account.

3.2 The Fair Trade Software Foundation as an initiative to increase the fairness of the software industry

Over the past decades, there have been several initiatives on ethics within software engineering, such as the Computer Professionals for Social Responsibility (CPSR) [9], a global organisation advocating responsible use of technology, which got dissolved in 2013. Other initiatives such as the Electronic Frontier Foundation, European Digital Rights, and the Global Network Initiative are all focused on the protection of digital rights and privacy. Apart from the Fair Trade Software Foundation, these non-profit organisations often do not focus on the broader aspect of ethics. Because of that, the Fair Trade Software Foundation was chosen for our research as it was open for improvement and we felt like it could very well have an impact on the software development industry.

FTSF’s mission states: *Our goal is to help grow the software development industry in developing economies by providing access to EU markets and building the skills and experience required to service the local market* [1]. As seen in their mission statement, they primarily emphasize on the sustainability benefits of creating employment and the growth of knowledge economies, but it is important to state they understand sustainability broadly as they also focus on other important areas such as fair labour conditions, career development, and gender equity. Companies that are accredited by the FTSF are expected to take all these areas into account.

3.2.1 Sources for the case study For a clear understanding of the FTSF, its values, and motives, several sources were used. All information was extracted from two versions of the official website of the FTSF, one older version from 2012 and one that was still being developed but included some essential new information. Apart from these documents, a representative of the FTSF also provided relevant information as a result of a case study interview.

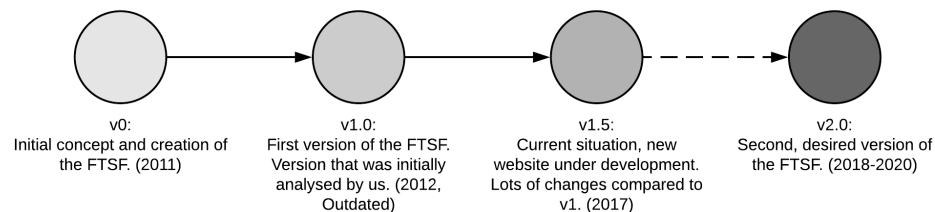


Fig. 1. Timeline of the development of FTSF

3.2.2 Origin of the FTSF In 2010, the concept of Fair Trade Software was conceived. The founders found there was an increasing interest and concern on Corporate Social Responsibility (CSR) and sustainability. After realising there was an unrealised potential in the extension of Fair Trade products to IT services, Fair Trade Software was created. Then, in 2011, the Fair Trade Software Foundation was founded to promote and further develop this model. This is v0 in the timeline depicted in Figure 1. In 2012, the initial website of the FTSF (ftsf.eu) was developed, which reflects the original vision of FTS and included standards and principles that were derived from the original Fair Trade guidelines of the World Fair Trade Organisation (WFTO). However, this version (v1.0) quickly became outdated, as they found out that many organisations who were interested in joining the FTSF had very different business models. This consequently made it very difficult to create universal, meaningful accreditation and certifications schemes. They then started to work on a new version (v2.0) which is still under development. During the time the interview was conducted, we caught them in the middle of the process of creating that new version, which is why they are currently in version v1.5.

3.2.3 Accreditation process of the FTSF over the years At first in v1.0 there were two types of membership grades for companies accredited by the FTSF, as seen in Table 1.

Membership grade	Description
Provider	IT companies located in an OECD country with a proven track record in the provision of quality software services. These companies will act as Project Managers and customer contact points and should be committed to knowledge sharing and the principles of the FTSF in order to create new IT employment opportunities in developing countries.
Partner	Smaller IT companies (5-250 employees) located in developing countries. These companies get access to new markets and the opportunity to learn global industry best practice. This is done by collaborating with the Provider companies that have more experience within the IT sector. These companies are expected to work with local talent and must be willing to adopt practices that will benefit the local community.

Table 1. Membership grades v1.0

However, due to the difference in business models of companies interested in joining the FTSF, the Partner/Provider model did not work. As a result of that, the accreditation/certification process had to be altered into its current version v1.5, where different membership classes have been created. Membership is now open to ICT firms of all sizes in developing and developed countries, as well as supporting organisations such as academic institutions and NGOs. Currently, the membership grades are divided as seen in Table 2.

Membership grade	Category	Description	Fee-Paying
Gold	Corporate members	For companies judged by the Foundation Board and have proven to be effective in reaching economic development goals. They have created new jobs in developing markets and enabled other companies in local markets to acquire innovative IT solutions.	X
Silver	Corporate members	For companies that actively pursue economic development goals within the markets in which they are active. Successful in capacity building and employment creation, but not do not meet all requirements of the Gold membership.	X
Bronze	Corporate members	For companies that are successful in creating employment and/or capacity building, but have not yet achieved significant volume in both areas to achieve Silver membership.	X
Partners	FTS Ambassadors	For academic partners, government departments, support organisations and NGOs. They participate in the advancement of FTS in ways such as academic research.	
Consultants	FTS Ambassadors	For individual consultants and other business professionals. They have expertise that can contribute to the Fair Trade Software mission, such as technology experts or business advisors that can provide mentoring.	
Supporters	FTS Ambassadors	For enthusiastic members of the public, to help create a community of supporters by sharing insights and opinions. No application procedure.	

Table 2. Membership grades v1.5

The process of accreditation for members in v1.0 can be seen in the BPMN-models in Appendix B (Figures 6-7). Once an IT company has become either a Provider or Partner, the process involves registering an IT project followed by the monitoring of the process by the FTSE as illustrated in the third BPMN-model in Appendix B (Figure 8).

In version 1.5, the application process changed significantly. To promote a more Agile way of working and avoid companies having to alter their business model, dialogue was considered more important than documentation. The current application process involves explaining your business model and why it could contribute to FTSE’s mission. If an organisation is able to show adherence to the FTS Principles (Table 4) and the Board approves of their application, they are granted a fitting membership grade.

3.2.4 Standards and principles of the FTSE Before investigating the standards and principles of the Fair Trade Software Foundation, it is important to clarify what these terms mean in the context of the FTSE.

- *Principles*: Fundamental statements that serve as a foundation for the use of Fair Trade Software in the software industry supply chain. In v1.5, additional principles were introduced.
- *Standards*: Norms intended to ensure the relationship between Partner and Provider companies is conducted according to the FTS principles. Not revised or used in version 1.5.
- *Requirements*: Concrete documented demands a company has to comply with in order to receive and maintain FTSE accreditation. Not revised or used in version 1.5.

In Table 3, a sample is provided of the first 5 requirements with their corresponding FTFSF Standard, of which the full table can be found in Table 13, Appendix E. The fourth column describes which challenge is addressed by each requirement. These requirements are all derived from the Standards of version 1.0 [35] [36]. In version 1.5 however, no 'Standards' document exists, as the FTFSF primarily emphasizes the importance of the principles. Fortunately, these requirements are still useful for identifying indicators. Table 12 in Appendix E also provides a many-to-many mapping of all requirements to the principle they enforce.

Identifier	Requirement	FTSF Standard	Challenge
R1	Provider ensures they comply with national law	PR1	CH9, CH10
R2	Provider and partner ensure they commit to Fair Trade Principles	PR2 / PA 1.1.1	CH8, CH9, CH10
R3	Provider and partner ensure they commit to environmental protection	PR3 / PA2	CH8
R4	Provider has direct relationship with customer, communication goes through them	PR4.1 / PA4.1	CH2
R5	Provider and Partner conclude contract for co-development	PR4.4 / PA4.4	CH2, CH3, CH4, CH5

Table 3. Sample of FTFSF Requirements v1.0

Identifier	Principle	v1.0	v1.5
P1	Employment creation	X	X
P2	Transparency and accountability	X	X
P3	Fair Trading Practices	X	X
P4	Payment of fair price	X	X
P5	Ensuring no child labour and forced labour	X	X
P6	Commitment to non-discrimination, gender-equity, women's empowerment and freedom of association	X	X
P7	Ensuring good working conditions	X	X
P8	Providing capacity building	X	X
P9	Promoting Fair Trade	X	X
P10	Respect for the environment	X	X
P11	Transforming lives		X
P12	Enhance employability		X
P13	Create sustainable opportunities		X
P14	Grow capacity to participate in global business		X
P15	Provide a social ROI		X
P16	Giving back		X

Table 4. FTSF Principles

ID	Challenge	Eco	Soc	Env	Principle	References
CH1	Managing security and access privileges	X			P8	[5] [8] [11] [16] [22] [29] [33] [43]
CH2	Overcoming teamwork difficulties	X	X		P8	[2] [21] [27] [45]
CH3	Cultural and societal differences	X	X		P6, P8	[5] [10] [13] [27] [39] [45]
CH4	Reducing lack of management and technical skills	X	X		P1, P8, P12, P14	[19] [27] [34] [42]
CH5	Stimulating domestic market development	X			P1, P8, P12, P14, P15	[19] [20] [26] [34]
CH6	Hidden costs	X			P8	[5] [8] [18]
CH7	Prevention of health issues		X		P7, P11	[2]
CH8	Respect for the environment			X	P10	FTSF P10, [44]
CH9	Removing forced labour and child labour		X		P5	FTSF P5, [6] [32]
CH10	Commitment to non-discrimination and gender equity		X		P6, P15	FTSF P6, [30]

Table 5. Challenges with respect to TBL and the addressing principle and the references to the challenge

Table 4 shows the fundamental principles of the FTSF. The first 10 principles were derived from the original Fair Trade principles of the World Fair Trade Organisation in version 1.0 and were slightly adjusted to make them fit for Fair Trade Software. In version 1.5, organisations willing to join the FTSF would have to adhere to 6 additional principles added by the FTSF. However, some of these 6 principles overlap with one another and with the 10 original principles, which is why the list could possibly be shortened or adjusted in the future as duplicates will be removed. Combined, the 16 principles meet the economic, social and environmental dimensions and create an overall guideline for organisations wanting to improve their fair practices.

Table 5 depicts the challenges that were found, which dimension in the TBL they belong to and which FTSF Principle plans to address each challenge. A total of 10 challenges are listed, 7 of which are found during the literature research (CH1-CH7) and another 3 were listed as these are all challenges the FTSF addresses with their principles and we could find evidence of (CH8-CH10). The principles were allocated to the challenges by comparing the official descriptions of the principles to the issues that were identified for each challenge. Not every single issue is resolved by a principle, but several principles can address multiple issues.

As seen, most challenges are affiliated with Principle 8: "*Providing capacity building*", which stresses the importance of providing mentors and role models for knowledge sharing and training of employees. The FTSF acknowledges the fact that this is the underlying principle upon which the foundation is built. Most importantly, this indicates that the adoption of Fair Trade Software practices has the potential to resolve challenges within the software supply chain.

Interesting to note is that although it is a perceived critical issue within global software development, the FTSF does not explicitly mention Supply Chain Risk Management (CH1), what technology to use and how to mitigate and manage risks within the supply chain. However, given a company in a developed country already utilizes adequate technologies for SCRM, one could say that "Providing capacity building" (P8) does address this issue because workers in developing countries are trained and gain experience in said technologies.

3.3 Areas of Improvement

Table 6 shows the identified Areas of Improvement, one as a result of the literature study and another 4 were retrieved from the interview conducted in the case study. The description of each area also includes a possible solution to the problem. These areas of improvement can be used as requirements for the definition of the certification method and help elaborate on its purposes.

Areas I_2 and I_4 are areas of improvement that can be addressed with the method, which is why these two are considered requirements in the development of the method. Areas I_3 and I_5 were identified at the time of the interview, but with the release of the new FTSF website, these were already implemented in version 1.5. Area I_1 is also relatively simple to address, this involves an elaboration of the 'Capacity building' principle (P8), in which it is stated an

organisation needs to provide a policy and offer training in the use technologies for adequate Supply Chain Risk Management.

Identifier	Area of Improvement	Description	Source
<i>I1</i>	Supply Chain Risk Management	More emphasis should be put on the use of technologies for security of products and individuals within the supply chain. This could be done by elaborating on P8: 'Capacity building', stressing the importance of the use of technology that is capable of protecting an organisation's assets.	Literature
<i>I2</i>	Prevent bandwagon jumping	Avoiding organisations claiming to do FTS as a sales gimmick, but not actually complying to the principles. A third party or a FTSP representative should be assigned to audit whether an organisation actually commits to the Fair Trade principles as they claim.	Case study interview
<i>I3</i>	Flexible application process	Organisations interested in joining the FTSP often have very different business models, which is why the application procedure should be flexible. To prevent organisations from having to alter their business model, agreements concerning FTS practices should be differentiated for each interested organisation.	Case study interview
<i>I4</i>	Lightweight assessment	To promote an Agile way of working, assessment should be simple, without excessive form-filling, documents and contracts. Organisations should be able to fill in one general form, which contains the most important sustainability indicators for that particular organisation.	Case study interview
<i>I5</i>	Focus on principles	The focus of Fair Trade practices should be on the principles, not necessarily on how to achieve it, as there are multiple correct paths. There should not be a set of general standards on how to adopt Fair Trade principles, as these could inhibit an organisation's capability to reach their goals.	Case study interview

Table 6. Areas of improvement

4 Defining a method for continuous improvement of FTS Practices

To define the method, three essential parts are needed. Firstly, the sustainability indicators, which are quantified information that help to explain and assess how organisational practices change over time. Then, there are the BPMN-models which explain the entirety of the improvement and accreditation process. Lastly, a dashboard/tool is needed to help with the assessment and visualise the results.

4.1 Sustainability indicators

A total of 74 sustainability indicators were identified (Table 14-16 in Appendix G). Table 8 shows some of these indicators. They were derived from the original FTSE application form (AF), the requirements (R), the Common Good Matrix 5.0 (CGM), the Global Reporting Initiative (GRI) disclosures and some of them are defined in collaboration with the author and the founders of the FTSE. As the indicators are used for an annual assessment, the data necessary for these indicators represent data collected in the year of assessment. Although they are most useful after accreditation, they are also essential for the application process. For each indicator, a set of properties are defined, as can be seen in Table 7.

Properties
1. <i>Identifier</i>
2. <i>Name</i> of the indicator
3. <i>Description</i> of the indicator
4. The <i>metrics</i> for measurement of the indicator, can either be numerical (e.g. diversity rate) or textual (e.g. policy on SCRUM).
5. <i>Source</i> of the indicator. Can either be own input, derived from the FTSE application form (AF), the Common Good Matrix (CGM) or the Global Reporting Initiative (GRI).
6. Whether the indicator is a <i>core</i> indicator, which is obligatory for all member organisations to take into account, or an <i>optional</i> indicator, which is recommended if an organisation has matured enough in their practices.
7. The <i>FTSE principle</i> for categorisation of the indicator.
8. <i>Dimension</i> with respect to the Triple Bottom Line.
9. <i>Business Rule</i> : Indicates the minimum values for each membership grade, either bronze, silver or gold.
10. <i>Confidentiality</i> : Whether the results of a particular indicator becomes public knowledge for all employees of a member organisation.

Table 7. Properties of sustainability indicators

ID	Name	Description	Metrics	Core	Principle
S1	Company Profile	General disclosure of the organisation	Provide consolidated annual reports of the last 3 years	Yes	P0
S7	Labour turnover	Rate at which employees leave and are replaced within an organisation	$\# \text{ Employees lost} / ((\# \text{ Employees begin} + \# \text{ Employees end}) / 2)$	Yes	P1
S60	Renewable energy rate	Measures ratio of energy which is renewable energy	Total usage of renewable energy / Total power consumption	No	P10
S67	Pension fund	Rate of employees with a pension plan put in place	Amount of employees with pension plan / Total amount of employees	Yes	P11

Table 8. Sample of sustainability indicators

Table 8 provides a sample of the sustainability indicators. An additional categorisation principle *P0* was added to define indicators that are identified as being general disclosure. Almost all indicators have been identified as a core one, except for those that affect the environmental dimension, to ensure organisations are not distracted and focus on the essential indicators. 'Going green' does not have a high priority for the FTSE, as their main focus is on growing stable sustainable segments of the economy that enable other sectors of the economy and ultimately result in the entire society improving. Environmental indicators are only optional for organisations that have already acquired a gold membership and are willing to take a look at their environmental practices.

The most important property of an indicator is the business rules that define its minimum values. These minimum values define each membership grade and help with the accreditation of prospective members and the recertification of current members. Several indicators have the same standards across all membership grades, such as 'Company profile' (*S1*), which should be provided in full, regardless of membership grade. Other indicators only have to be reported on, because they are either not relevant enough to consider for assessment (*S4. Employees*) or they do not currently have realistic values defined for them (*S33. Pay gap*). The most indicators however, have several minimum values, where the requirements for acquiring a Bronze membership are more lenient than those for the acquisition of a Silver or Gold membership (*S67. Pension fund*). Once an organisation has sufficient indicators graded as Bronze, Silver or Gold they are granted their respective membership grade. The specific amount of indicators required to get Bronze, Silver or Gold is still undefined, as there is no way yet to create a realistic indication for this. The minimum values for each indicator can be seen in Table 15 in Appendix G. Important to note is that these values are merely a snapshot of the business rules, because defining realistic minimum values is an ever-changing process which requires time and experience.

How these indicators are measured, assessed and graded is explained in the next section where the method is defined.

4.2 Defining a method

The main goal is to create a lightweight and customisable method, which will serve four purposes:

1. Providing a method for member organisations to annually assess and improve their FTS practices.
2. Help with the application process of organisations interested in joining the FTSE.
3. Alleviate the burden of FTSE's current accreditation bureaucracy (this will require automating part of it with a tool)
4. Providing a mechanism to allow a self-regulating community to report on unfair practices.

The FTSE certification method we have designed consists of three core processes. A) Annual Assessment Fair Trade Software practices, B) Whistleblowing mechanism, and C) Check whistleblower alerts. Each of these processes is specified using BPMN diagrams (Where A has two levels of diagrams due to the use of sub-processes). The process map (Figure 15) and the BPMN diagrams can be found in Appendix I.

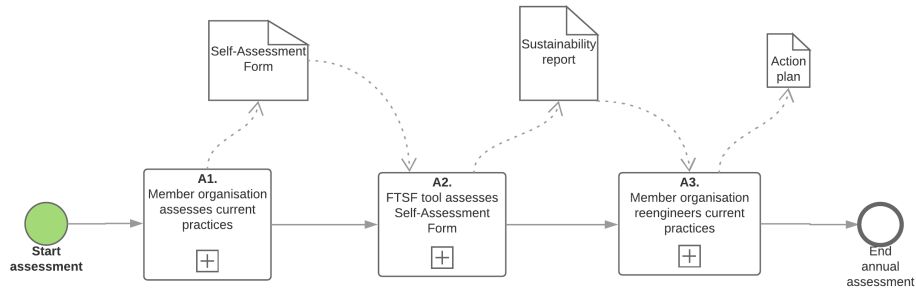


Fig. 2. Overview of the main process of the FTSE certification method

A. Annual Assessment Fair Trade Software practices

The first core process of the method is the definition of the actual method, and reflects on the first three purposes described above. It consists out of three subprocesses, as seen in Figure 2.

A1. Member organisation assesses current practices

The first subprocess describes the way a member organisation could measure and assess their current practices using the defined sustainability indicators (Figure 17). This activity starts with deciding the inclusion of optional indicators (A1.1), in case an organisation wants to go the extra mile. After collecting data (A1.2) and preparing it (A1.3), they can assess their performance on the indicators (A1.4) by filling in the Self-Assessment Form (A1.5). The Self-Assessment Form represents a form within a Socio-Environmental Auditing tool, that has

open fields for all the indicators. Eventually, the organisation will submit the Self-Assessment Form (A1.6) so it can be checked by the FTTSF.

A2. FTTSF tool assesses Self-Assessment Form

The second subprocess describes the automated process of checking the Self-Assessment Form (Figure 4). A socio-environmental auditing tool is used here that is able to measure the performance on indicators (A2.1) using the business rules. It then assigns a membership grade to this performance if the data is sufficient to obtain one (A2.2). After identifying the gaps (A2.3), a conclusion can be made on the performance. In the case an organisation does not comply with at least the Bronze standards, the FTTSF rejects accreditation (A2.4). Feedback is then generated (A2.5) and is sent to the organisation (A2.6), who receive the result of their performance (A2.10). In the case the organisation does comply sufficiently they are granted accreditation by the FTTSF (A2.7). The tool automatically generates a sustainability report (A2.8), which includes the obtained membership grade and identified gaps on which they can improve to get to the next membership grade. This report is sent to the member organisation (A2.9, A2.11). In both cases, the organisation can then proceed to re-engineer their current practices.

This process and the method are supported by a web-based, configurable socio-environmental auditing tool called openSEA. This tool is developed as a Master Business Informatics (MBI) thesis by Niels Bik at Utrecht University. OpenSEA is capable of automatically generating the sustainability report in which the indicators and its values are visually displayed. By using charts and plots, the values can be displayed in a comprehensible way, and differences over the year are easily identified. Additionally, for each indicator, gaps can be identified and shown in the report, as an incentive for organisations to improve on certain areas and obtain higher membership grades.

Appendix K shows the current YAML model of the indicators which is used in openSEA. By defining the indicators, metrics, and the business rules, the tool can automatically determine the FTTSF membership grade an organisation qualifies for. A fragment of the YAML model is shown below, where it is shown what is needed to implement the indicator *S12. Local talent* in the tool.

```
name: FTTSF
version: 4
metrics:
  empl_cur_year:
    name: Employee count (current year)
    type: number
  empl_local:
    name: Employee count (local)
    type: number
    help: Amount of local talent hired in offices in developing countries.
indicators:
```

```

S12:
  name: Local talent
  description: Amount of local talent hired in offices in developing countries
  category: P1
  type: percentage
  value: (empl_local / empl_cur_year) * 100

```

```

reportItems:
  - name: Local talent
    value: S12

```

```

certifications:
  - name: Bronze
    colour: "#cd7f3d"
    requirements:
      - indicator: S12
        operator: ">"
        value: 80
  - name: Silver
    colour: "#9aa6b2"
    requirements:
      - indicator: S12
        operator: ">"
        value: 90
  - name: Gold
    colour: "#c6a82c"
    requirements:
      - indicator: S12
        operator: ">"
        value: 95

```

Appendix L shows 3 screenshots of the model-driven tool. For illustrative purposes, a fictional company was used and fictional data was entered into the tool. First, annual data is provided on the data entry screen (Figure 22). This then creates an annual report showing all the values of the indicators (Figure 25). These reports then consolidate into a general report which provides an overview of the progress an organisation has made over the years (Figure 23). Another screen automatically shows the certification level that your organisation qualifies for (Figure 3) by assessing the scores of the indicators based on the business rules that were defined in the YAML model of Appendix K.

A3. Member organisation re-engineers current practices

The third subprocess represents a way the organisation could re-engineer their current practices and improve on their FTS practices (Figure 19). After reviewing the sustainability report (A3.1), they can set goals (A3.2) based on the gaps that were identified by the SEA tool. They then create the points of improvement, prioritize them and create an action plan (A3.3, A3.4, A3.5).

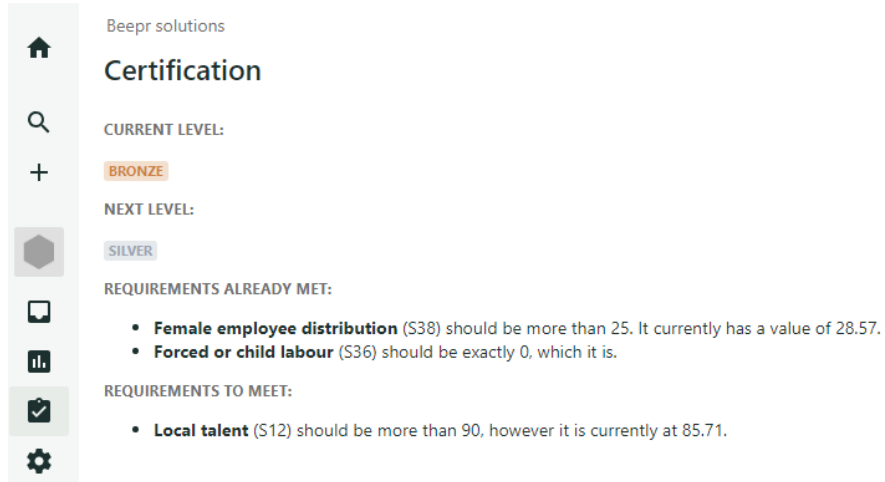


Fig. 3. Certification level screen and identified gaps

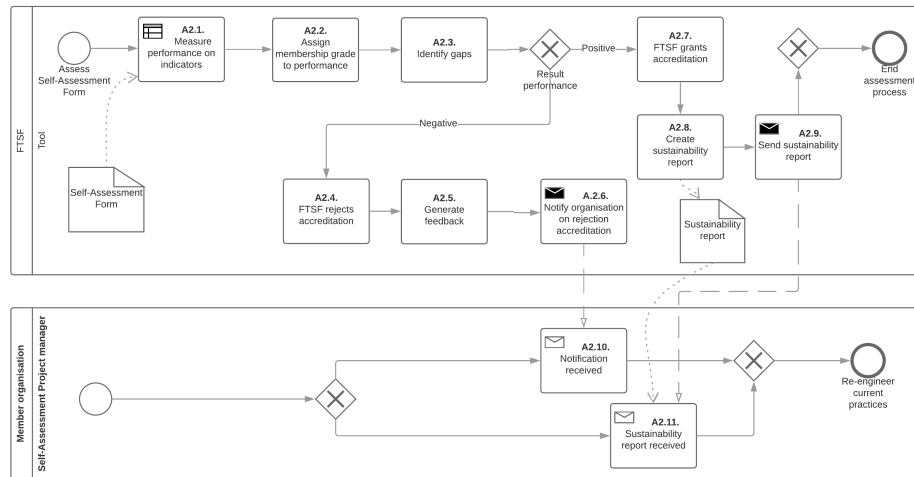


Fig. 4. FTSP tool assesses Self-Assessment Form

In multiple instances, they then take action on the improvement (*A3.6*). After this, the assessment process is done and they can repeat it in their next annual assessment of their practices.

B. Whistleblowing mechanism

The second core process addresses an issue that was brought up during the case study (Figure 20). Process A would allow prospective members to game the accreditation process. Organisations can enter data into their assessment forms that does not reflect their actual practices, while it still grants them membership. To stop this bandwagon jumping, a whistleblowing mechanism is introduced. Whistleblowers could be employees within the member organisation or independent third parties who observed bad practices within the member organisation and feel an obligation to report on it. Alternatively, they can check the Self-Assessment Form and conclude if the member organisation is cheating. For this, transparency is needed. Employees within an organisation would have to be allowed to anonymously look into the Self-Assessment Form (*B1*, *B2*) and report on any false information if they are willing to do so (*B3*).

C. Check whistleblower alerts

The third core process defines the process for checking the whistleblower alerts, for which human intervention is required (*C1*) (Figure 21). Whistleblower alerts should not directly result in a rejection of accreditation. Alerts imply bad practices, but in reality, the alert could have been sent by a disgruntled employee. In the initial assessment of the alert (*C2*), it is checked whether there are more alerts on the same issue and additional information is requested if necessary (*C3*). After assessment (*C4*), a conclusion can be made about the severity of the alert. If there is a confirmation of bad practices (*C5*), the FTSF will act accordingly (*C6*). In case of a false alarm, the whistleblower case is closed (*C7*).

	Example 1	Example 2
Gap	Our organisation primarily consists out of male employees (90%).	Only 20% of our energy consumption consists out of renewable energy.
Goal	By the end of 2018, have an increase of female employees of at least 20%.	By the end of 2018, have an increase in renewable energy usage by at least 50%.
Point of Improvement	Start actively recruiting female employees whenever a vacancy is available.	Invest \$10.000 into the acquisition of solar panels to produce own renewable energy.

Table 9. Differences in concept within process A

For clarification of what gaps, goals and points of improvement are, two examples have been given in Table 9. Gaps are identified by the SEA tool and the organisation should be able to set their own goals and point of improvement to improve their practices and obtain a higher membership grade.

5 Validation

We interviewed the two founders of the Fair Trade Software Foundation for the validation of the method. One of these is also the director of a software

development organisation based in the Netherlands. This organisation is also a member of the FTSF and actively promotes Fair Trade Software by working together with IT companies in Kenya.

During the expert assessment, we discussed the BPMN-models of the method, the sustainability indicators, and the SEA-tool, following the protocol set up in Appendix J. The socio-environmental auditing tool used (openSEA) was still in an earlier development phase at this point. At the time of the expert assessment, only a small demo was shown and it was quickly discussed, as it had less functionality than the current version, which allows the definition of business rules (Appendix K).

We showed the BPMN-models of the created method (Figures 9-14 in Appendix H) to the experts and asked them to provide feedback on the activities. The validation matrix of Table 10 shows the result of that feedback. It reports on the differences between the current version of the method and the pre-validation version. In general, the model had to be changed in two ways. Firstly, the process would have to be as automated as possible, to reduce the workload of the FTSF for the accreditation. Secondly, to avoid the bandwagon jumping, a whistleblower mechanism would have to be included, to promote a self-regulating community.

A total of 59 changes were identified and processed in the new method (Appendix I). 28 activities were removed because they were unnecessary and not achievable. 14 activities were changed because they were either in the wrong order or had an incorrect name. 17 activities were inserted, 10 of them for the whistleblowing mechanism and another 7 to complete the method.

Method change	Total	Removed	Changed	Inserted
<i>Total changes</i>	59	28	14	17
<i>Complete</i>	44	26	2	16
<i>Partial</i>	15	2	12	1
<i>Motivation</i>		Unnecessary, removal of manual check/audit process	Change of order, change of name, change of semantics	To complete the method, inclusion of whistleblowing mechanism

Table 10. Validation matrix of method

During the discussion of the method, it was established that the entire process of the method is quite easy to understand, but that the complexity is in the implementation of the method due to limited resources. The problems with the model would only occur during the implementation phase and thus the process in itself is not as important. As a result, the minimum viable product for the moment were the indicators and the SEA tool that was discussed during the meeting and the process would have to be changed into something that would barely require any human intervention for the FTSF.

After discussing the sustainability indicators, an additional 12 indicators were inserted that were missing. 8 indicators were removed as they were deemed irrelevant. Then, for each indicator, it was discussed whether it should be a

core or optional indicator for organisations to take into account. All indicators except for those that affect the environmental dimension were adjusted to be core indicators.

The next steps were to collaboratively work on the minimum values for each membership grade for the indicators and to implement features into the SEA tool that would support these business rules. For example, the sustainability indicator *S12. Local talent* initially had low values beneath 50% for each membership grade, but was then altered to a respective 80%, 90%, and 95% after collaboration with the FTSE (Table 15 in Appendix G). The experts indicated that they were interested in developing this further and using the process the method defines as a guideline for implementation over the next 2 years.

Overall, the experts were pleased with the process, indicators, and tool and it represents a method that is workable and useful for the FTSE. After a second validation by email, the FTSE notified us that the method would be included as a feature in the next version of their framework and website.

6 Discussion

We are aware of some limitations that might affect the validity of our research.

The research we have done has a developed country bias. The literature we read was mostly produced by researchers in developed countries and we have only involved experts from developed countries. Therefore, we are missing the perspective of the developing countries. This is something that should be addressed in future research.

The list of challenges that we have found is likely not exhaustive. There is a possibility that there are other challenges in software supply chains of which we are not aware or that we have missed during our literature research.

The same issue affects the set of sustainability indicators. There might be other indicators better suited to measure some of the ethical issues. Fortunately, as we and the FTSE get more experienced in applying the certification process, the whole set of indicators is also expected to evolve into a more comprehensive list.

By making the list of indicators used by the FTSE publicly known, there is a chance organisations focus on improving their values instead of critically reflecting on the actual fairness of their practices. Additionally, since there is no real auditing process involved with the certification, organisations could provide false data to obtain a higher membership grade. Introducing the whistleblowing mechanism is an important factor to prevent this, but hopefully, as the certification process matures in the future, other measures can be taken to avoid bandwagon jumping.

By using BPMN to define the process part of the method, we facilitated a way to communicate with the FTSE, as they were familiar with this modeling language. As discussed earlier, another good candidate to define this part of the method is to use PDD. This would better clarify the product part of the method.

If it is considered cost-effective by the FTSF members, we will create a PDD in the future.

While creating the certification method, we got into contact with the founders of the FTSF about what the Self-Assessment Report looks like and how it works. During our conversations, it was discovered that a lot of the information that was present on the FTSF's official website was outdated and had to be updated. As a result of this, the earlier version of the FTSF website that was initially used during our research is not publicly available anymore. One thing that was mentioned as being outdated is that the Partner / Provider model did not work well for some organisations. For example, a company could open a subsidiary in Africa, in which case that company would be both Partner and Provider. Because of this, several aspects of the structure of this paper had to be changed. To ensure that the research done was not in vain, we kept track of the different versions the FTSF has undergone using a timeline (Figure 1). Fortunately, the foundation for the principles and standards remained the same, so the method was still relevant and would not become outdated.

After the expert assessment, it was discussed with the founders of the FTSF that the FTSF principles could very well be removed from their framework. The original 10 principles were derived from the WFTO and not all of them were relevant for the FTS domain. The additional 6 principles that were introduced later overlap in certain areas and thus could very well be either removed or merged in the near future. Nonetheless, we believe these principles still serve their purpose as guidelines for the certification method, even if they get removed from the FTSF framework.

The method is valid from the subjective perspective of experts. Applying and implementing the method in practice will reveal issues and hidden weaknesses that we have overlooked and will likely lead to future changes and improvements of the certification process.

While establishing the values for the business rules that define the separate membership grades, we realised realistic values are difficult to define for some of the indicators. Values that are established in this paper represent a snapshot and they are prone to be changed in the near future. Fortunately, with the support of the discussed SEA-tool, business rules can be easily updated if necessary.

The goal of the FTSF is to implement a fully automatic certification process. With the help of the business rules and the SEA-tool, it is possible to automate the assessment of indicators which have numerical values. But for indicators which require a textual response, more clearcut rules have to be created in order for them to be automatically assessed by the tool. Therefore, as of now, a completely automatic certification process will not be possible until the method has matured more.

7 Conclusions and Future Research

This paper proposed a method that member organisations of the Fair Trade Software Foundation can use to annually assess their Fair Trade Software practices.

This is done by providing data in a socio-environmental auditing tool, based on a set of sustainability indicators. Additionally, the FTTSF has a means to check this data and grant accreditation to those who are qualified to receive it. We investigated current challenges in the software development supply chain and into the potential of Fair Trade Software to address these challenges. We found that most challenges can be solved with adequate capacity building, which is the key principle of the FTTSF. Due to a limited amount of resources, a self-regulating community is stimulated in this method, by allowing whistleblowers to report on unidentified bad practices.

The validation of the method gave positive results and resulted in the method being added as a feature to the framework and website of the FTTSF. However, additional research is required into the possibility of implementing something like this method. Issues concerning this will only arise during the implementation phase and additional validation of this method will be required.

Appendix M (Figures 26-29) shows an infographic, designed to summarise the content of this research in a graphical way.

Future directions will involve more research into Fair Trade Software and the implementation of parts of this method. Apart from identifying overlooked or new challenges and consequently exploring new ethical issues, additional research should also be done from the perspective of developing countries for a more comprehensive understanding of fairness in the global software supply chain.

As of now, membership grades are provided to organisations only if all of the indicators score at the minimum levels of bronze, silver, and gold. This means if all but one indicator scores at a silver membership level, the organisation will still be accredited as a bronze partner. Logically, not every indicator is as important to indicate fairness as the other, which is why in the future the indicators should be weighted to their importance. This allows organisations to focus on the most valuable aspects of being fair, instead of putting a lot of effort into the lesser important matters.

More clear-cut criteria are needed for the indicators that require a textual response, in order to fully automate the certification process. Combined with the development of a working SEA tool, this would allow the FTTSF to incrementally work towards the implementation of their framework.

Other potential future work is discovering the best practices in terms of fairness and ethical behavior once a large enough community of FTS members has been established. Additionally, once this large community has been established, an auditing mechanism might be required apart from the whistleblowing mechanism, to completely ensure organisations are as fair as they claim to be during their assessment.

On a final note, we hope that this paper and the proposed method will contribute to the mission of the Fair Trade Software Foundation.

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A Process Deliverable Diagram of Research Method

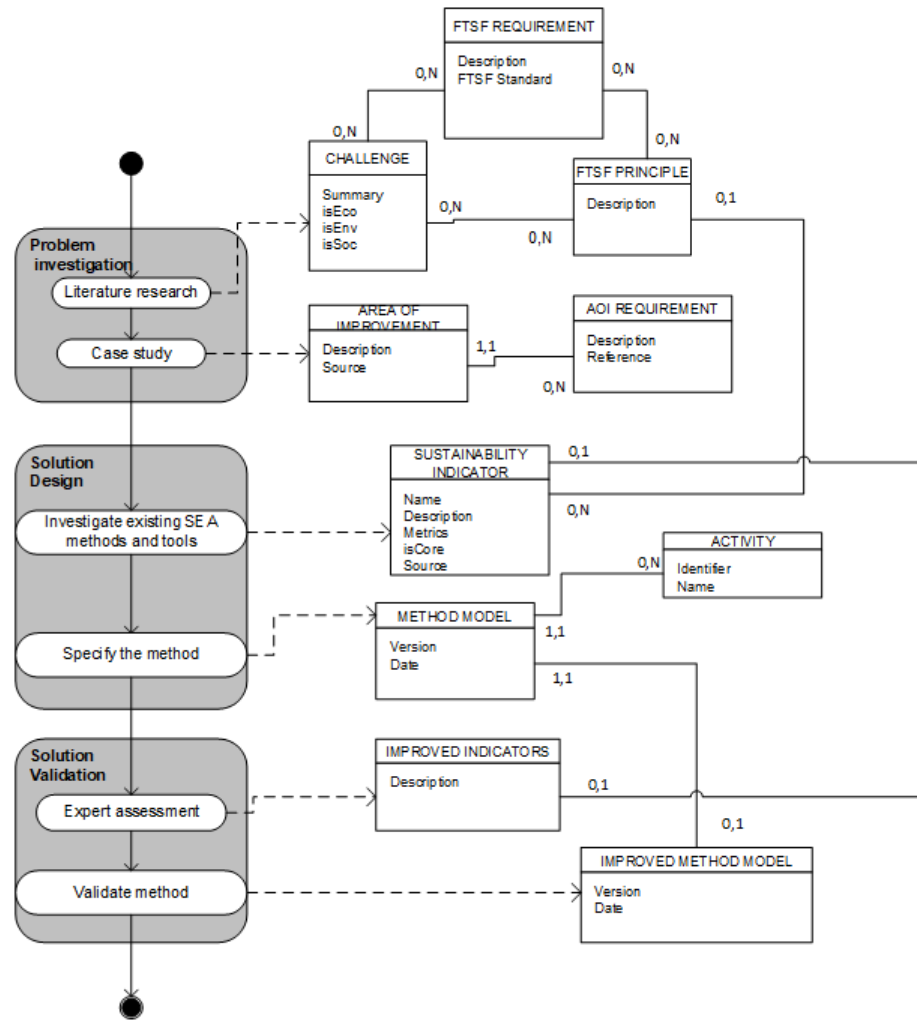


Fig. 5. PDD on Research Method, its concepts and relationships

B BPMN Models of Version 1.0 FTSF

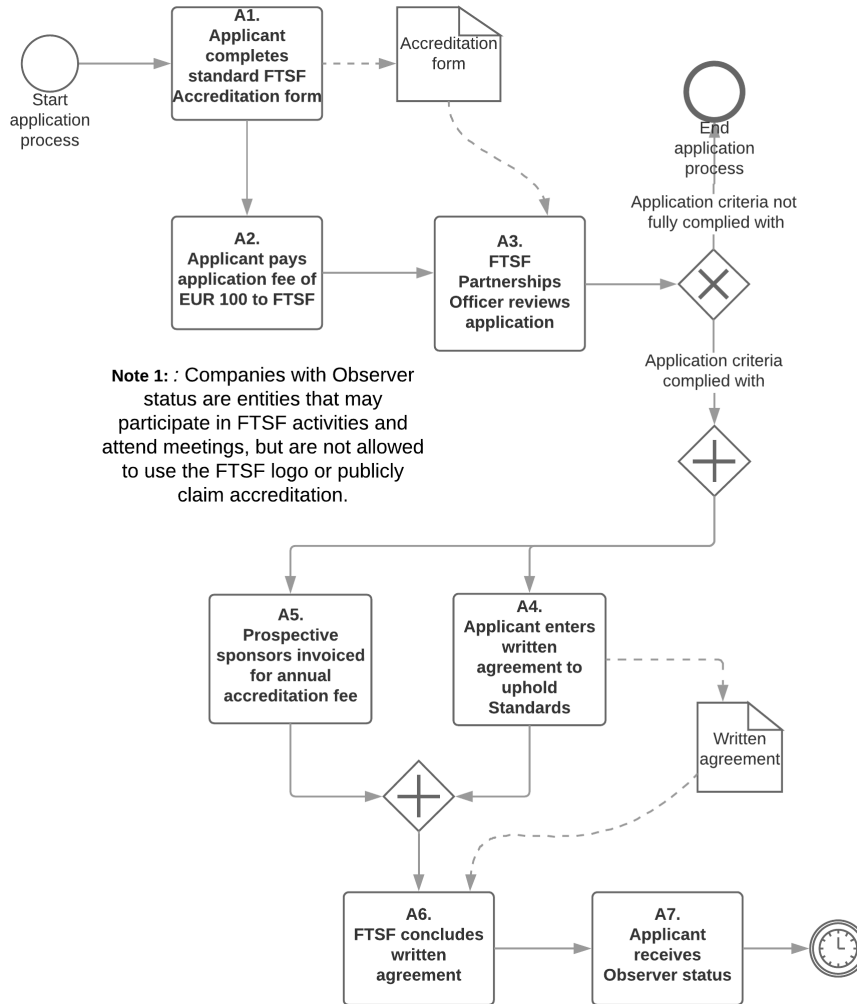


Fig. 6. Application process 1/2

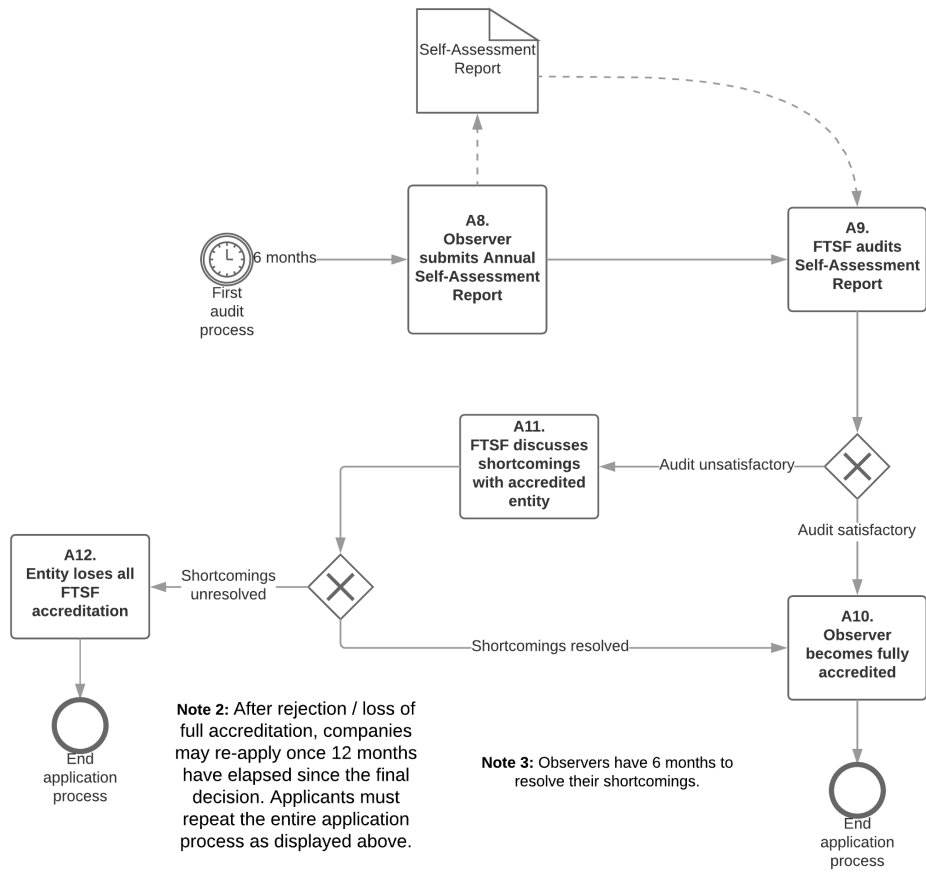


Fig. 7. Application process 2/2

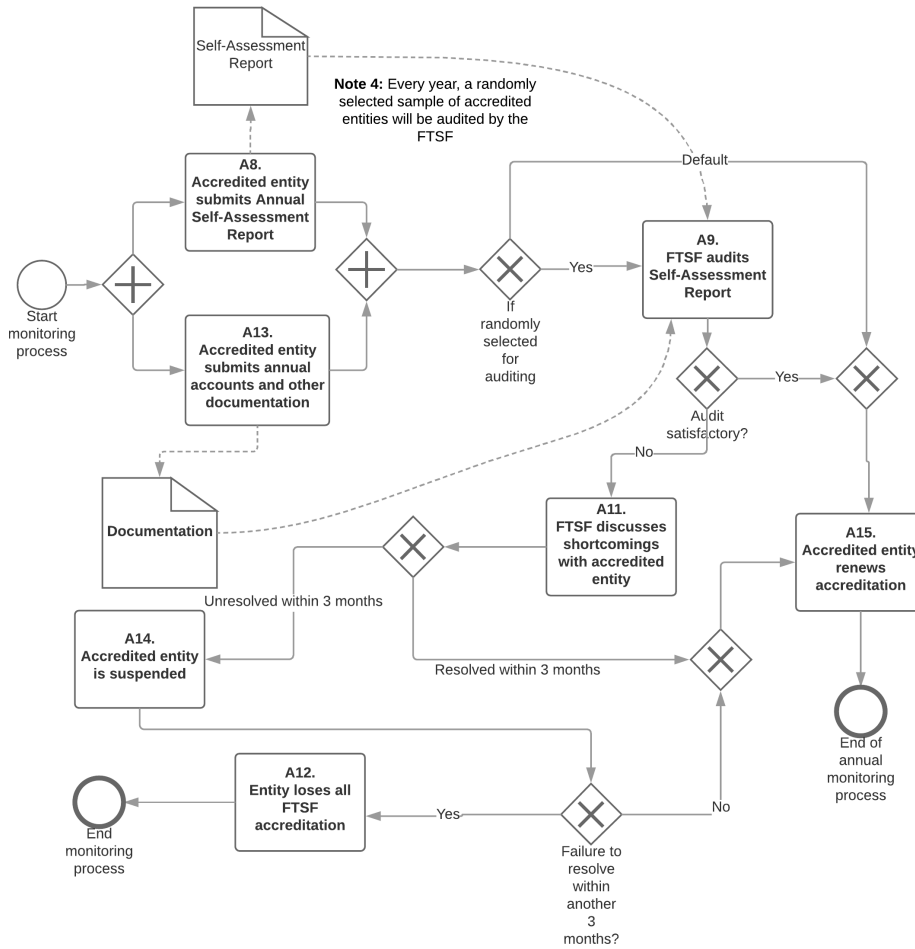


Fig. 8. Monitoring process

C Papers of literature study

Reference	Article Title	Source
[13]	Risks, Benefits, and Challenges in Global IT Outsourcing: Perspectives and Practices.	Scholar
[39]	Research on Information Systems in Developing Countries: Current Landscape and Future Prospects.	Snowball
[27]	Outsourcing Best Practices.	Scholar
[2]	Human resource issues, challenges and strategies in the Indian software industry.	Scholar
[10]	Addressing the Challenges of Software Industry Globalization: The Workshop on Global Software Development.	Scholar
[42]	IT outsourcing and core IS capabilities: Challenges and lessons at Dupont.	Scholar
[19]	Extending Fair Trade to create Digital Employment opportunities for marginalised urban youth.	F'TSF Website
[31]	Critical Success Factors for Managing Offshore Software Development Projects	Snowball
[20]	Creating Shared Value through Fair Trade Software: Putting the principle of shared value creation into practice: Fair Trade Software (FTS); Where Open Source meets Impact Sourcing.	F'TSF Website
[21]	Syncing or sinking: global software outsourcing relationships.	Scholar
[5]	Globalization and oshoring of software.	Scholar
[25]	Outsourcing decision support: a survey of benefits, risks, and decision factors.	Scholar
[22]	IT-enablement of supply chains: understanding the barriers.	Scholar
[18]	Critical success factors from IT outsourcing theories: an empirical study.	Scholar
[16]	Evaluating and mitigating software supply chain security risks.	Scholar
[29]	Software and Supply Chain Risk Management Assurance Framework.	Scopus
[45]	A systematic review of knowledge sharing challenges and practices in global software development.	Scopus
[15]	Software supply chain risk management: From products to systems of systems.	Scopus
[43]	Objectives for managing cyber supply chain risk.	Scopus
[3]	A Systemic Approach for Assessing Software Supply-Chain Risk	Scopus
[34]	Indian IT outsourcing industry: Future threats and challenges	Scopus
[8]	Analysis of a Software-Focused Products and Service Supply Chain	Scopus
[26]	Offshore outsourcing and innovation capabilities in the supply base: evidence from software firms in Bangalore.	Scopus
[11]	We cannot blindly reap the benefits of a globalized ICT supply chain!.	Scopus
[33]	International Standard Efforts Help Address Challenges in Todays Global ICT Marketplace.	Scopus

Table 11. Papers literature study

D Literature study on challenges

CH1. Managing security and access privileges By far, the most frequently reported challenge within software supply chains was about security and access privileges. Jharkharia and Shankar [22] reported that as early as 2000, these were already considered to be the two most important barriers in supply chains using internet and extranet technologies. And with the growing trend of outsourcing, supply chains security risks becomes an even greater concern [16]. As traditional supply chains are able to secure their physical products in warehouses with safes, locks, and keys, the use of internet for communication and transmission poses a greater threat for the products within a software supply chain [8]. Even with the most state-of-the-art firewalls and encryption methods, it still does not ensure an absence of vulnerabilities within their information systems. Aspray, Mayadas and Vardi [5] stated that the longer a supply chain and their lines of communication is, the more threat there is to their security. The foremost reason for this risk is due to a perceived lack of authority and responsibility of primary data records throughout the supply chain. Several authors stress the importance of Supply Chain Risk Management (SCRM). SCRM "seeks to manage and mitigate cyber and supply chain risk throughout an acquisition and sustainment lifecycle for an element or a system" [11]. Although there are some disagreements about the fundamental objective of SCRM [43], Shankles states it impacts every governmental and commercial organisation using ICT. Generally agreed upon key objectives are trustworthiness, integrity, security, reliability, resilience and flexibility [29]. Unfortunately, a lack of leadership support and resistance to changing technologies and practices proves to be a barrier of implementing SCRM [33]. Perhaps even more challenging than protecting products is the security of individuals [5]. Employees can lose their privacy, their job, property and, security, although they have little power to protect themselves and are mostly not involved in important business decisions on security.

CH2. Overcoming teamwork difficulties The second most reported on challenge is the complexity of teamwork along the supply chain. Agrawal and Thite [2] conducted research on the Indian IT industry and found that often a lot of software professionals prefer to work alone to have complete control over a project, without having to waste time on different opinions, team meetings and without the risk of others taking advantage of their achievements. They added that the short lifespan of IT projects makes it difficult for employees to develop a social bond and link their personal goals to those of their team members. This short life span is linked to a high employee turnover, especially when organisations decide to outsource or offshore. Often, this causes confusion and stress amongst employees about their responsibilities and the social dynamics within the team [27]. A high turnover disturbs the knowledge-sharing process, enforces more energy into building social relationships and causes repetitive knowledge-sharing with new employees. Additionally, the technical knowledge imbalance due to different educational backgrounds and experiences creates knowledge gaps, which affects the quality of knowledge-sharing between employees within a team as they lack a similar way of encoding and decoding exchanged

messages [45]. Relationships between employees within a team are not the only key elements towards a successful project. A high congruence between client and developer is also necessary for the progression into a larger, highly skilled project [21].

CH3. Cultural and societal differences Another challenge, which is also related to teamwork difficulties, are the cultural and societal differences between employees within the supply chain [13]. As supply chains grow bigger due to outsourcing, communication paths also become longer and more complicated as the cultural and language differences create barriers, such as the increased difficulty of sharing and absorbing knowledge [45]. This becomes even more difficult when the different parties are participating in non-face-to-face communication [39]. Consequently, supply chain networks decentralise, become more diverse and are harder to control [5]. Mikita and DeHondt [27] report that these differences can negatively impact the outcome of IT projects, as it is not clear whether the different religions, holidays and regular working hours of the outsourced team mesh well with the outsourcing team. Damian, Lanubile & Oppenheimer [10] add that the differences in attitude towards hierarchy, time management, and risk avoidance are also factors to keep in mind when determining an outsourcing service provider.

CH4. Reducing lack of management and technical skills Haxby and van Weperen [19] reported that one of the biggest issues in developing countries such as Kenya is a lack of professional skills such as project management techniques. Even though these countries have seen a growing trend of well educated young people with decent theoretical knowledge of IT, they still struggle to find employment, as just technical knowledge is no longer sufficient. Apart from the technical skills, a mix of business and interpersonal skills are now also required to work in IT [42]. Even countries with a relatively more developed IT market such as India, have shown that a significant amount of graduates are not ready to become employed in the industry [34]. Unfortunately, these unemployed young people are stuck in a deadlock. They are not trusted to manage or work on large-scale IT projects due to their inexperience and lack of skills, but they can not gain this experience as they are not presented any opportunities. Additionally, Mikita and DeHondt [27] stated that often an inadequate team is left in place to manage the local companies because they underestimate the effort it takes to keep the outsourcing project up and running.

CH5. Stimulating domestic market development The same deadlock that affects the careers and professional skills of individuals in developing countries, affects the overall domestic IT market development in those countries. According to Haxby and van Weperen [20], companies in Kenya are disadvantaged due to a perceived lack of capability which causes them to be excluded from participation in large IT projects in their own economy. Most of the Kenyan large-scale IT projects are outsourced to international firms, which consequently inhibits the opportunities for the development of their own local market. Due to this, the local companies have to rely on small, low-value IT projects [19]. Similarly, India's software industry, while being more developed compared to

Kenya's, have become strong in their production and execution capabilities but are still lacking in their innovation capabilities due to an underdeveloped domestic market [34] [26].

CH6. Hidden costs In comparison to traditional supply chains, software supply chains perceive higher costs to finish, release and maintain their products [8]. The e-distribution of software requires more attention to support and maintenance and requires up-front installation of the necessary infrastructure, which results in high startup costs. Additionally, software products are bound to have bugs and quality issues, which causes an increase in costs for testing facilities and procedures. Also, due to the rapid growth of technology, older products become obsolete at a faster rate and require firms to regularly update or replace their software products. Although the reduction of costs seems to be the primary reason for organisations to outsource [18], it does come accompanied with hidden costs for security, protection of intellectual property and legal costs due to conflicting regulations, procedures, and practices [5].

CH7. Prevention of health issues Even though there are no official documented studies about this challenge, Agrawal and Thite [2] reported about an increase of anecdotal evidence suggesting that burnout, stress and other health issues are affecting the IT industry in India. Surprisingly, there has not been any conducted research on this matter 14 years later, even though it is a critical issue and we strongly believe organisations should pay attention to a safe, healthy working environment for all employees.

E FTSF Standards

	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16
R1																
R2	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
R3										X			X			X
R4		X	X													
R5	X		X					X				X				
R6	X		X					X			X	X		X	X	
R7		X	X					X				X		X		
R8				X												
R9						X									X	
R10		X						X							X	
R11			X						X							X
R12			X			X								X	X	
R13						X								X	X	
R14						X								X	X	
R15						X								X	X	
R16	X							X				X		X		
R17						X									X	
R18			X			X								X	X	
R19					X							X			X	
R20					X										X	
R21	X	X						X								
R22								X							X	
R23	X			X				X				X				
R24	X		X									X				
R25	X			X						X					X	
R26							X								X	
R27							X	X						X	X	
R28							X								X	
R29							X								X	
R30	X							X	X	X	X		X		X	X

Table 12. Requirements and their corresponding principle

Identifier	Requirement	FTSF Standard	Challenge
R1	Provider ensures they comply with national law	PR1	CH9, CH10
R2	Provider and partner ensure they commit to Fair Trade Principles	PR2 / PA 1.1.1	CH8, CH9, CH10
R3	Provider and partner ensure they commit to environmental protection	PR3 / PA2	CH8
R4	Provider has direct relationship with customer, communication goes through them	PR4.1 / PA4.1	CH2
R5	Provider and Partner conclude contract for co-development	PR4.4 / PA4.4	CH2,CH3, CH4, CH5
R6	Provider engages in training of Partner's employees	PR4.6 / PA4.6 / PA 1.1.2.2	CH2, CH4, CH5
R7	Provider shall take lead with cooperation of Partner	PR4.5 / PA 4.5	CH2, CH4
R8	Provider and Partner ensure fair wages are regularly and timely provided	PR4.7 / PA4.7 / PA1.4.1.1 / PA1.4.1.3	
R9	Provider and Partner treat each other with respect	PR4.8 / PA4.8	CH3, CH10
R10	Partner has appropriate HRMS with good industrial relations and training programmes	PA1.1.2.3	CH4
R11	Partner adopts annual work plan to improve their FTS Practices	PA1.1.2.1	CH5
R12	Partner sets up grievance procedure for workers to be heard and have right to appeal	PA1.1.2.4 / 1.2.1.4	CH10
R13	Partner management does not engage, support or tolerate any form of discrimination	PA1.2.1.1	CH3, CH10
R14	Partner management does not engage, support or tolerate all forms of coercion and abuse	PA1.2.1.2	CH7, CH9, CH10
R15	Partner management does not engage, support or tolerate sexual intimidation, abuse or exploit	PA1.2.1.3	CH7, CH9, CH10
R16	Partner sets up policy regarding improvement staff qualifications	PA1.2.2.1	CH4, CH5
R17	Partner management ensures men and women are treated equally in all aspects	PA1.2.2.2	CH3, CH10
R18	Partner sets up special grievance procedure for sexual harassment	PA1.2.2.3	CH10
R19	Partner ensures regular working hours with no forced labour and child labour	PA1.3.1 / 1.4.1.7 / 1.4.1.8	CH9
R20	Partner ensures minimum age of hazardous work is 18 years	PA1.3.1.3	CH7, CH9
R21	Partner ensures workers are aware of right, duties, responsibilities, salaries and work schedules	PA1.4.1.2	CH2
R22	Partner puts adequate regulation on sick leave/ annual leave/maternity leave in place	PA1.4.1.5 / 1.4.1.9 / 1.4.1.10	CH7
R23	Partner ensures permanent workers receive legally binding written contract	PA1.4.1.6	
R24	Partner ensures all regular work is to be undertaken by permanent workers	PA1.4.1.11	
R25	Partner works towards permanent worker benefits of fund or pension scheme	PA1.4.2.1	CH5
R26	Partner ensures health and safety regulations for provision of a healthy, safe working environment	PA1.5	CH7
R27	Partner provides training in occupational health and safety regulations, health protection and first aid	PA1.5.1.2	CH5, CH7
R28	Partner provides access to potable water and clean sanitary facilities	PA1.5.1.4	CH7
R29	Partner provides adequate lighting, heating and ventilation for optimal working conditions	PA1.5.1.6	CH7
R30	Partner carries out initiatives benefiting the wider, local community	PA3	CH5

Table 13. FTSF Standards and challenges they address

F Case study

The conducted interview has been separated into several categories of questions:

Our understanding of FTSE

- Is our understanding correct of the accreditation process? (Showing the BPMN models)
- How does the FTSE monitor your practices?
- Does the FTSE closely monitor whether the standards are complied with and how?

Following FTSE standards

- What is done by your company to comply to FTSE standards?
- How exactly do you measure whether you are complying to their standards?
- Has the Partner company shown signs of improvement since the adoption of FTS practices?
- What would you say are areas that require improvement in the standards?
- Does the FTSE enforce you to invest in Supply Chain Risk Management for both organisational and individual security for Providers and Partners?

Principles Accompanied with these questions, all 10 principles were printed out on cards for a clear overview.

- Are some principles prioritized over others and could you prioritize them using the cards?
- Which principle would cause immediate loss of status if not complied with?
- Vice versa, which principle would be less severe if not complied with?
- Would you say every principle is followed as severely as the others?
- Does the FTSE enforce each principle as severely as the others?

Self-Assessment Report (SAR) This is the most important part of the interview, as this retrieves information most relevant for the creation of our method.

- What does the process of creating an Annual Self-Assessment Report look like?
- Are some areas of the Self-Assessment Report more important than others, if so, which ones?
- Which aspects of the SAR are most difficult to measure?
- What are areas of improvement that would be helpful to improve the measurement and creation of SARs?
- What happens to the SARs that are not randomly selected for an audit?

Requirements

- What are critical things to think about when creating this method, coming from someone who has experience with FTS practices?
- Would a method be useful / is it needed, that would help with assessing the actual fairness in the supply chain?
- Would support be helpful to report and improve on your practices?

G Sustainability indicators

ID	Req\AF	CGM	GRI	Eco	Soc	Env	Confidentiality
S1	AF1		102				Private
S2	AF2.3.2		102-8				Public
S3	AF1		102				Private
S4			102-7				Private
S5					X		Public
S6			201-1	X			Private
S7	AF1.6	C1	401-1	X	X		Public
S8	AF2.3.3	C2		X	X		Public
S9	AF2.3.4	C2			X		Public
S10	AF2.3.5	C1	401-3		X		Public
S11	R2	C1		X			Public
S12			202-2	X	X		Public
S13				X			Public
S14					X		Private
S15		C2		X	X		Public
S16		C1.2		X	X		Public
S17			204-1	X			Private
S18	AF2.7	A4	402		X		Public
S19			205	X			Public
S20					X		Public
S21				X			Private
S22				X			Private
S23					X		Public
S24					X		Public
S25				X			Public
S26					X		Public
S27		A1	414		X		Public
S28		B1.3			X		Public
S29		D1			X		Public
S30	R8			X			Public
S31		C1.3	405-2		X		Public
S32		C2.1	202-1	X	X		Public
S33		C2.1		X	X		Public
S34				X			Public
S35				X			Private
S36	AF2.3	E1.3	408/409		X		Public
S37			403		X		Public
S38	AF1.5	B4.1	405-1		X		Public
S39		B4.1	405-1		X		Public
S40	R13	C1.3	406		X		Public

ID	Req\AF	CGM	GRI	Eco	Soc	Env	Confidentiality
S41	R14	C1.3	406		X		Public
S42			407		X		Public
S43		C1.3	405-1		X		Public
S44			412-2		X		Public
S45	AF2.3.14	C1.2	403		X		Public
S46	R28				X		Public
S47	R26	C1.4			X		Public
S48					X		Public
S49	AF2.3.13	C1.4			X		Public
S50			403		X		Public
S51	R6		404		X		Public
S52	R27	C1.2	404		X		Public
S53			418		X		Private
S54			418		X		Private
S55				X			Public
S56	R2				X		Public
S57							Public
S58						X	Public
S59	AF2.4	E3	302			X	Private
S60	AF2.4	E3	302			X	Private
S61	AF2.4	E3				X	Private
S62	AF2.4	E3				X	Private
S63	AF2.4					X	Private
S64	AF2.4		306			X	Private
S65			307	X		X	Private
S66		A1	412		X		Public
S67			201-3	X			Public
S68			404-3		X		Public
S69				X	X		Private
S70				X	X		Public
S71	AF2.1	A1			X		Public
S72			401-2		X		Public
S73	AF2.5	E2	413		X		Public
S74				X	X	X	Public

Table 14: Indicators with their corresponding source, TBL dimension and confidentiality [Empty source fields imply indicator is own input]

ID	Bronze	Silver	Gold
S1	Provided in full	Provided in full	Provided in full
S2	Less than 30% informal employment	Less than 20% informal employment	Less than 10% informal employment
S3	Overview	Detailed, BMC	Detailed, BMC
S4	Report only	Report only	Report only
S5	At least 10 weeks	At least 16 weeks	At least 16 weeks
S6	Report only	Report only	Report only
S7	Report only	Report only	Report only
S8	Less than 45 hours	Less than 45 hours	Less than 40 hours
S9	More than 15 days	More than 20 days	More than 25 days
S10	None	At least 2 days	At least a week
S11	Report only	Report only	Report only
S12	More than 80% local talent employed	More than 90% local talent employed	More than 95% local talent employed
S13	More than 50%	More than 75%	More than 90%
S14	Overview	Evidence of at least 1 case	Evidence of at least 3 cases
S15	No paid overtime	Paid overtime	Paid overtime
S16	Less than 7%	Less than 5%	Less than 3%
S17	Report only	Report only	Report only
S18	Minor decisions should be communicated with employees	Employees should have a say in some decisions made in the organisation	Horizontal structure in which employees are directly involved in the decision making
S19	None - Instant rejection	None- Instant rejection	None - Instant rejection
S20	Ad-Hoc policy	HR Policy in place	Published job grades and pay scales

Table 15 continued from previous page

ID	Bronze	Silver	Gold
S21	Should at least be doing their finances	Report only	Report only
S22	Report only	Report only	Report only
S23	Forbidden	Forbidden	Forbidden
S24	Policy should be put in place	Policy should be put in place	Policy should be put in place
S25	Scrum used by development teams	Scrum used by development teams and other departments (HR, Sales)	Entire company run Agile
S26	Report only	Projects not in line with FTS values should be minimized	Projects have to be in line with FTS values
S27	Report only	Report only	Report only
S28	Report only	Report only	Report only
S29	Report only	Report only	Report only
S30	Minor mistakes are tolerated if they are adjusted	All wages should be provided in a regular and timely manner	All wages should be provided in a regular and timely manner
S31	No difference	No difference	No difference
S32	Should be at least at level of local minimum wage	Should at least be 10% higher than the local minimum wage	Should be at least 20% higher than the local minimum wage
S33	Report only	Report only	Report only
S34	Report only	Report only	The wages should be adjusted accordingly to inflation
S35	Report only	Electronic where possible	All electronic

Table 15 continued from previous page

ID	Bronze	Silver	Gold
S36	Zero tolerance	Zero tolerance	Zero tolerance
S37	Zero tolerance	Zero tolerance	Zero tolerance
S38	More than 10%	More than 25%	More than 40%
S39	Report only	More than 5%	More than 15%
S40	Should be working towards zero tolerance	Zero tolerance	Zero tolerance
S41	Should be working towards zero tolerance	Zero tolerance	Zero tolerance
S42	All employees have the right	All employees have the right	All employees have the right
S43	Report only	Should have diversity of 20%	Should have diversity of 40%
S44	Should be working towards receiving training	Should have had training in this at least once	Must have an annual training session
S45	Once in 2 years	Once every year	Once every 6 months
S46	All employees should have access	All employees should have access	All employees must have access
S47	Physical work environment has to be safe	Physical work environment has to be safe	Physical work environment has to be safe
S48	Report only	Report only	Report only
S49	Should be working towards an evacuation plan	Should have an evacuation plan in place	Must have an evacuation plan in place
S50	Report only	Report only	Report only
S51	Should be working towards provision of training sessions	Should have annual training sessions	Must have multiple training sessions in this each year

Table 15 continued from previous page

ID	Bronze	Silver	Gold
S52	Should be working towards provision of training sessions	Should have had training in this at least once	Should have annual training in this
S53	Report only	Report only	Report only
S54	Should be working towards zero tolerance	Zero tolerance	Zero tolerance
S55	Report only	Should have a policy for SCRM	Must have a policy for SCRM
S56	Should be promoting the FTSP logo on their corporate website	Should actively be promoting FTSP	Must be actively promoting and spread the word around the community to also work towards this movement
S57	Has relationships with academic institutions and is open to work	Actively engaged in projects with academic institutions	Actively engaged in projects and has contributed to published academic works
S58	Policy should be put in place	Policy should be put in place	Policy should be put in place
S59	NA	NA	Should take this into account
S60	NA	NA	Should take this into account
S61	NA	NA	Should take this into account
S62	NA	NA	Should take this into account
S63	NA	NA	Should take this into account
S64	NA	NA	Should take this into account
S65	NA	NA	Zero tolerance
S66	Zero tolerance	Zero tolerance	Zero tolerance
S67	More than 90%	More than 95%	All employees
S68	Should be working towards implementing this	Should have had these reviews at least once	Must have annual reviews

Table 15 continued from previous page

ID	Bronze	Silver	Gold
S69	Report only	Report only	Report only
S70	Forbidden	Forbidden	Forbidden
S71	Report only	Should be working towards promoting and enhancing CSR	Must commit to promoting and enhancing CSR
S72	All employees	All employees	All employees
S73	Report only	Should be working towards investing in the wider community	Must commit to providing community benefits
S74	Report only	Report only	Report only

Table 15: Minimum values for each indicator and their respective membership grades

ID	Name	Description	Metrics	Core Principle
S1	Company Profile	General disclosure of the organisation	Provide consolidated annual reports of last 3 years	Yes P0
S2	Legally binding contracts	Percentage of staff with an employment contract, percentage of staff in developing countries employed as freelancers, subcontractors or other informal employment	Provide outline on percentages of employment types	Yes P0
S3	Primary functions	Indication of the primary functions and products/services of the organisation	Provide explanation of how FTS fits in with the company business model with BMC	Yes P0
S4	Employees	Amount of employees an organisation has at the moment of assessment	# employees current year - # employees last year / # employees last year x 100	Yes P0
S5	Paid maternal leave	Indication on amount of paid maternal leave an employee is entitled to	Amount of paid maternal leave an employee is entitled to	Yes P1
S6	Annual turnover	The overall annual turnover of the organisation	Revenue current year - Revenue last year / Revenue last year x 100	Yes P1
S7	Labour turnover	Rate at which employees leave and are replaced within an organisation	# Employees lost in a year / (# Employees beginning + # Employees end of year) / 2	Yes P1
S8	Average working hours	Indication of average hours full time employees are required to work according to their contract	Average weekly hours / Required weekly hours stated in contract	Yes P1
S9	Paid holiday days	Indication on amount of paid holiday days an employee is entitled to	Amount of paid holiday days an employee is entitled to	Yes P1
S10	Paid paternal leave	Indication on amount of paid paternal leave an employee is entitled to	Amount of paid paternal leave an employee is entitled to	Yes P1

ID	Name	Description	Metrics	Core Principle
S11	Employment creation	The amount of job opportunities created due to FTS practices	Indicate the amount of jobs that were created either directly or indirectly by FTS practices	Yes P1
S12	Local talent	Amount of local talent hired in offices in developing countries	Local talent employees / Total amount of employees	Yes P1
S13	Project success	Rate at which projects have been planned, executed and completed in a timely manner	Amount of successful projects / Total amount of projects	Yes P1
S14	Forward linkages	Indication on the amount of business that were created as a result of growth in developing country	Provide outline on forward linkages as a result of growth	Yes P1
S15	Paid overtime	Indication on whether employees are entitled to paid overtime	Total amount of overtime worked / Amount of employees working overtime	Yes P1
S16	Health rate	Health/sickness rate of employees	Average amount of sick days for employees / Total amount of work days	Yes P1
S17	Local suppliers	Percentage of procurement budget spent on suppliers local to a project	Amount spent on local suppliers / Total procurement budget	Yes P1
S18	Transparency	Whether upper management adequately communicates with all its employees and includes them in decisions	Provide outline on transparency between upper management and rest of employees	Yes P2
S19	Corruption	Amount of identified incidents of corruption within the organisation	Provide outline on incidents of corruption and actions taken towards it	Yes P2
S20	Human Resources policy	Whether an adequate policy is put in place on HR	Provide outline on current HR policy	Yes P2
S21	Financing practices	Whether the organisation have sufficient financing practices	Provide outline on your financing practices	Yes P2

ID	Name	Description	Metrics	Core Principle
S22	Tax payments	Whether the organisation fulfill their tax payments in a correct and timely manner	Provide outline on the times tax payments were incorrectly fulfilled and why	Yes P2
S23	Cryptocurrency policy	Whether an adequate policy is in place on the mining/trading of cryptocurrencies	Provide outline on your current cryptocurrency policy	Yes P2
S24	Downloading policy	Whether an adequate policy is in place on illegal downloading	Provide outline on your current downloading policy	Yes P2
S25	Agile methodologies	Indication on the adoption of Agile methodologies within an organisation	Provide outline on the adoption of Agile methodologies within the organisation	Yes P3
S26	Domain of projects	Indication of type of business an organisations creates revenue with, whether in line with FTS values	Provide outline of [1-3] largest projects, with whom and what?	Yes P3
S27	Ethical supply management	Indication of ethical, social and ecological aspects of largest suppliers, whether in line with FTS values	Provide outline of [1-3] largest suppliers	Yes P3
S28	Ethical financial management	Indication of ethical, social and ecological aspects of largest investors, whether in line with FTS values	Provide outline of [1-3] largest investors	Yes P3
S29	Ethical client management	Indication of ethical, social and ecological aspects of largest clients, whether in line with FTS values	Provide outline of [1-3] largest clients	Yes P3
S30	Wage provision	Whether the company provides wages in a regular and timely manner	Amount of complaints on wages not being provided on time	Yes P4
S31	Equal pay men and women	Difference between the average wage of men and women in same positions	Average wage women / Average wage men	Yes P4

ID	Name	Description	Metrics	Core Principle
S32	Minimum wage	Difference between average wage for lower-level employees and the local minimum wage	Average wage / Local minimum wage	Yes P4
S33	Pay gap	Difference in average wages between lower-level employees and senior managers	Avg wage lower level / avg wage senior management	Yes P4
S34	Spending power	Indication on whether salaries increase when inflation does	Percentual salary difference - Inflation rate	No P4
S35	Payment handling	Indication on the way an organisation handles its payments	Provide outline on your payment handling practices	Yes P4
S36	Forced or child labour	Ratio of employees which are either forced or under 15 without internship	Amount emps forced or child / # total employees	Yes P5
S37	Underaged hazardous work	Amount of employees under 18 exposed to hazardous work	Amount underaged / Total amount of employees	Yes P5
S38	Female employee distribution	Amount of females employed at an organisation	# of females / total # of employees	Yes P6
S39	Female executives	Amount of females employed at an executive position at an organisation	# of females in executive position / total # of executives	Yes P6
S40	Non-discrimination	With a grievance procedure in place, indication of the severity of discrimination on workforce	Amount of complaints on discrimination	Yes P6
S41	Non-intimidation	With a grievance procedure in place, indication of the severity of coercion, abuse and intimidation on workforce	Amount of complaints on sexual intimidation, verbal/physical abuse or coercion/exploitation	Yes P6
S42	Freedom of association	Indication of violations of a worker's right to exercise freedom of association	Provide outline on any violations of freedom of association and actions taken	Yes P6

ID	Name	Description	Metrics	Core Principle
S43	Diversity rate	Rate of employees with a different ethnicity/tribe than the country/tribe organisation resides in/consists of	# employees different ethnicity / Total amount of employees	Yes P6
S44	Ethical training	Amount employees receiving training on sexual harassment, violations, abuse, discrimination or corruption	Amount receiving training / Total amount of employees	Yes P6
S45	Inspection rate	Rate at which company premises is inspected on safety measures of equipment, wiring, outlets, leakage and other hazards	Amount of inspections per year / 365	Yes P7
S46	Facilitation access	Rate of employees that have access to potable water, clean sanitary, and refrigeration facilities / lunch food	Amount of employees with access / Total amount of employees	Yes P7
S47	Physical work environment	Whether indoor workplaces have adequate lighting, heating and ventilation in context of local weather conditions	Provide outline on lighting, heating and ventilation facilitation on indoor workplaces	Yes P7
S48	Overall satisfaction rate	Indication of overall satisfaction of employees	Provide outline on indications of overall satisfaction of employees and what is done to stimulate this	Yes P7
S49	Evacuation plan	Whether working environment is equipped with fire exits, escape routes, fire alarms etc.	Provide outline on the escape routes, fire alarms and emergency exits	Yes P7
S50	Accidents	Amount of accidents occurring on the workforce	Amount of incidents happened on the workforce	Yes P7
S51	Training provision	Indicates amount of employees trained in management and professional skills	Amount employees trained	Yes P8
S52	Safety / First aid training	Rate of employees receiving basic training in safety, first aid and occupational health	Amount of employees received training / Total amount of employees	Yes P8
S53	Privacy breaches	Amount of identified incidents concerning breaches of privacy of employees	Amount incidents on workforce + Amount incidents from outside parties	No P8

ID	Name	Description	Metrics	Core Principle
S54	Loss of data	Amount of incidents concerning leaks, thefts and loss of data	Amount incidents leaks + thefts + loss of data	No P8
S55	Supply Chain Risk Management	Whether an adequate policy is in place to minimize risk of cybersecurity	Provide outline on current policy to minimize/mitigate security issues	Yes P8
S56	FTS promotion	Whether an organisation's affiliation with the FTSF has spread awareness of the organisation	Number of organisations directly or indirectly involved with an FTS project	Yes P9
S57	Academic cooperation	Whether the organisation actively works together with universities or academic facilities to enhance FTS related knowledge	Provide outline on academic cooperation you participate in	Yes P9
S58	Green policy	Indication on the green policy an indication has put in place	Provide outline on your green policy	No P10
S59	Power consumption	Difference in power consumption compared to previous years	Power current year - Power last year / Power last year x 100	No P10
S60	Renewable energy rate	Measures ratio of energy which is renewable energy	Total usage of renewable energy / Total power consumption	No P10
S61	E-waste	Measures contribution to the annual E-waste production in kg/year	Sum of: Mass of all items * Units / Average lifespan of items	No P10
S62	Environmental awareness	Whether the organisation takes steps to inform its employees on environmental policies and protection	Provide outline of current initiatives to spread awareness on environmental protection	No P10
S63	Power Usage Effectiveness	Measures rate IT equipment power consumption compared to overall power consumption	Total facility energy / IT equipment energy	No P10
S64	Recycling waste	Ratio of disposed trash which is recycled or at least recyclable	Amount recycled/recyclable / Total amount disposed trash	No P10

ID	Name	Description	Metrics	Core Principle
S65	Environmental non-compliance	Indication of fines and sanctions for non-compliance with environmental regulations and laws	Provide outline of any monetary and/or non-monetary sanctions as a result of non-compliance	No P10
S66	Human rights violations	Amount of identified incidents of violations of human rights	Amount of complaints or observations of human rights violation	Yes P11
S67	Pension fund	Rate of employees with a pension plan put in place	Amount of employees with pension plan / Total amount of employees	Yes P11
S68	Performance/development review	Rate of employees receiving performance and career development reviews	Amount receiving reviews / Total amount of employees	Yes P12
S69	Offshore outsourcing	Indication on whether an organisation outsources its functions offshore or Impact Sourcing	Provide outline on your offshore outsourcing practices	Yes P13
S70	Sustainable opportunities	Indication of organisation engaging in subcontracting which prevents transparency	Provide outline of current offshore outsourcing activities	Yes P13
S71	Commitment to CSR	Whether an organisation commits to promote and enhance their Corporate Social Responsibility	Provide outline of any CSR initiatives company takes part in	Yes P15
S72	Health care	Rate of employees with adequate health care	Amount employees with health care / Total amount of employees	Yes P15
S73	Community benefits	Whether an organisation uses its increased income and skills to benefit the wider community in its area using IT	Provide outline of any initiatives benefitting the wider community	Yes P16
S74	Other remarks	Any other remarks concerning initiatives stimulating FTS practices	Provide outline on any other initiatives that are worth mentioning or stimulate FTS practices	No

Table 16: Sustainability indicators

H Pre-validation BPMN-Models of proposed method

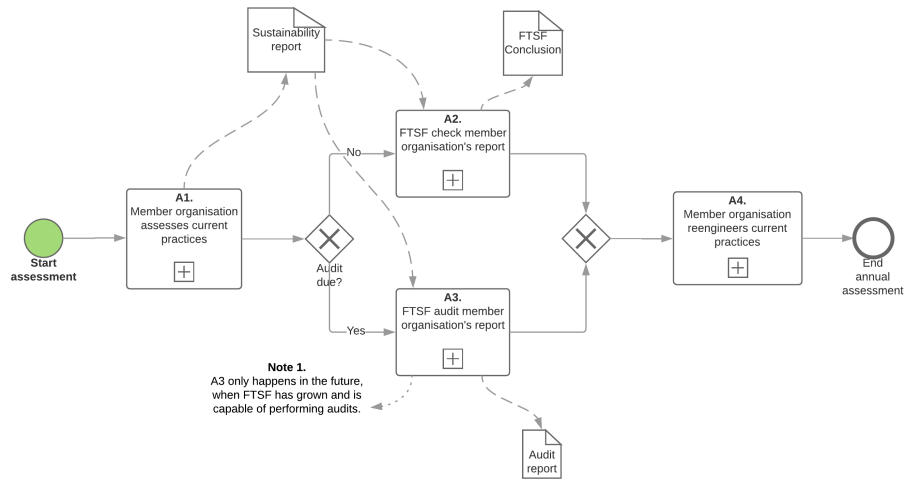


Fig. 9. Overview model of proposal method

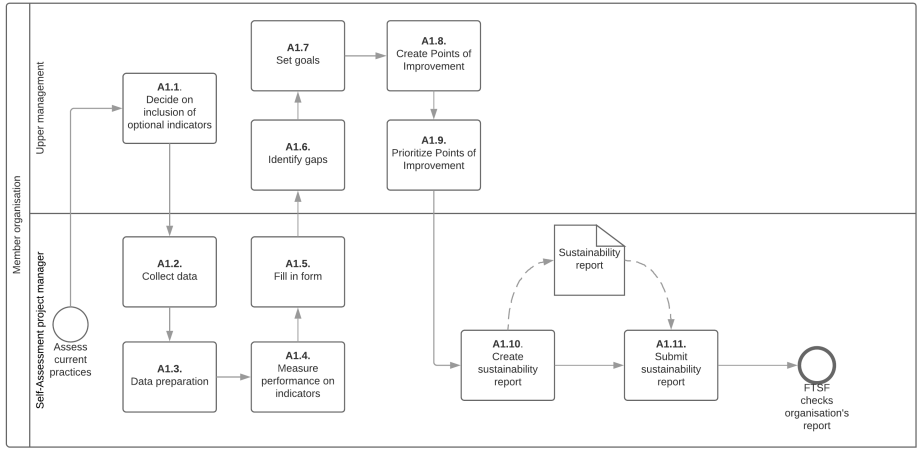


Fig. 10. Model of member organisation assessing their practices

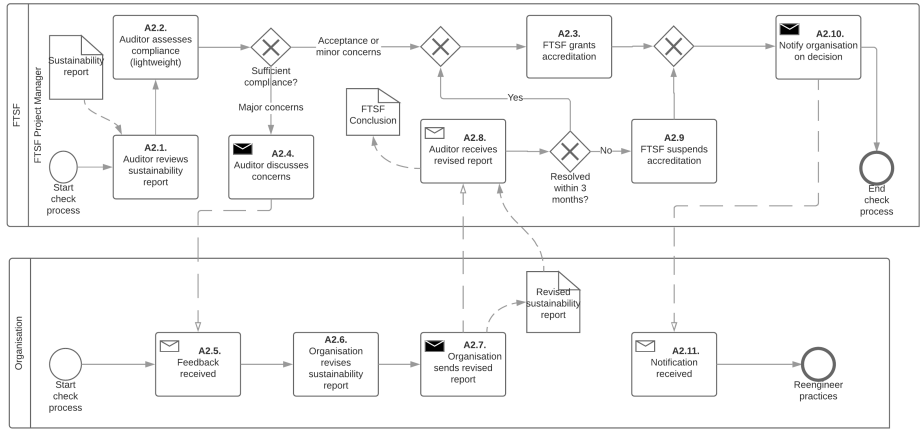


Fig. 11. Default path of FTSF checking the results of member organisation

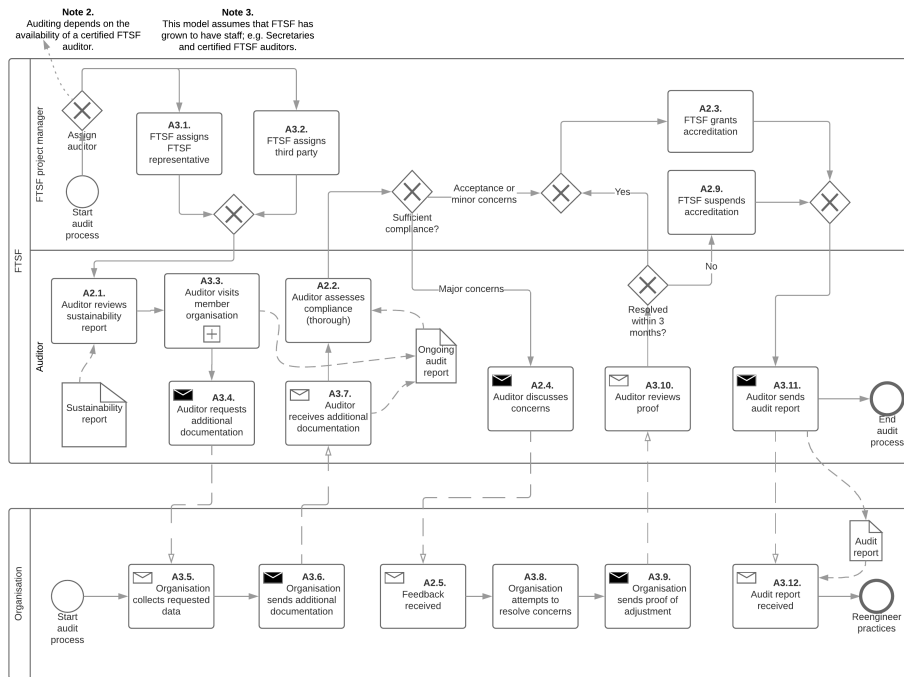


Fig. 12. Optional path of FTFSF performing an audit on the practices of member organisation

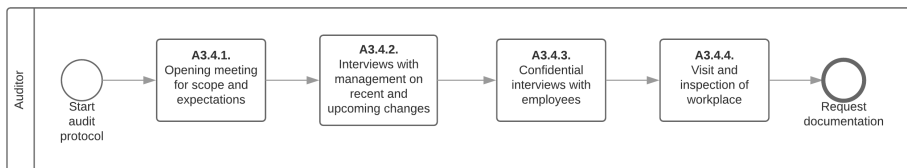


Fig. 13. Audit protocol

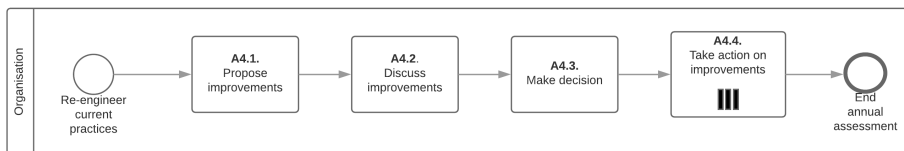


Fig. 14. Re-engineering of Fair Trade Software practices

I Validated BPMN-Models of method

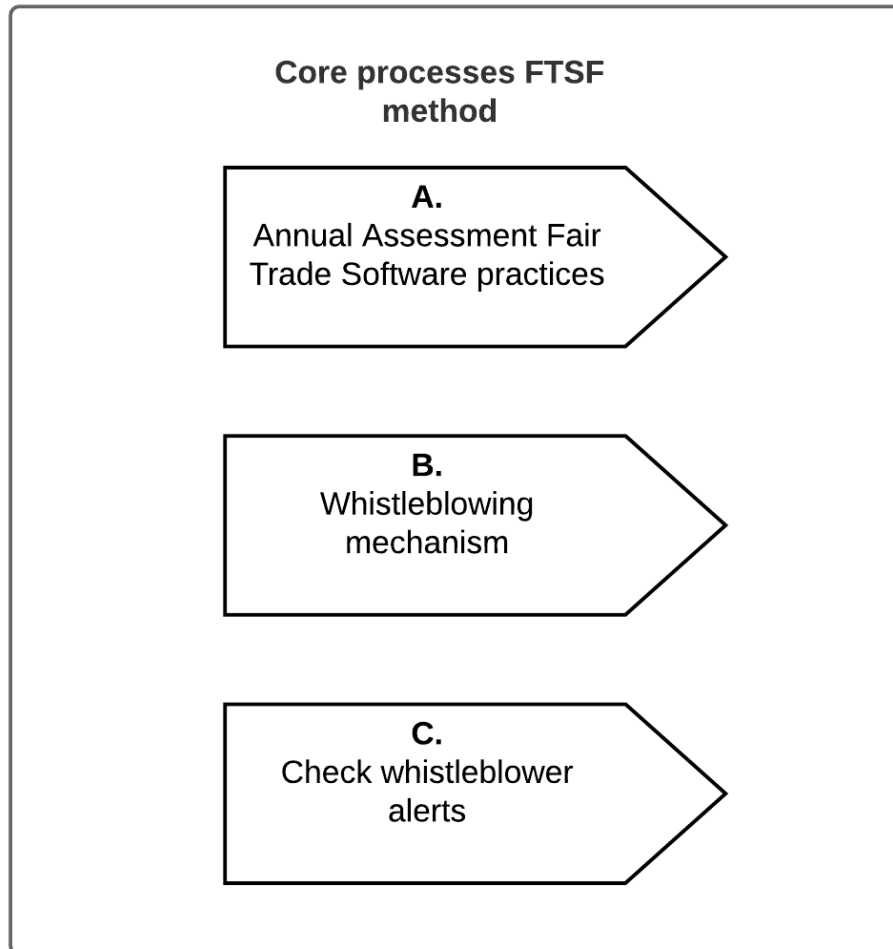


Fig. 15. Core processes of method

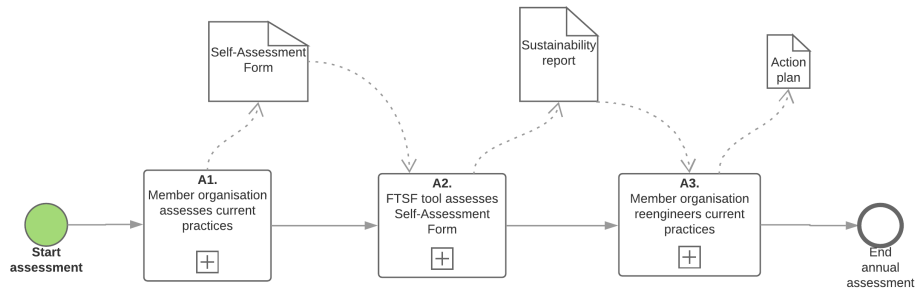


Fig. 16. Overview model of validated method

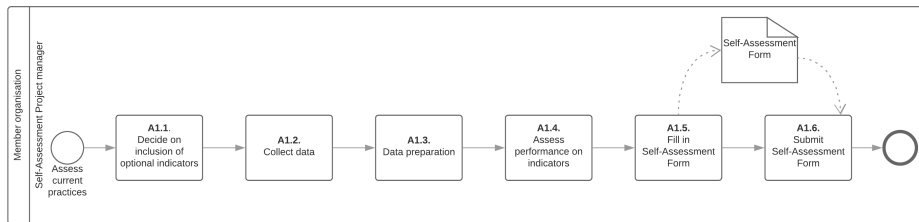


Fig. 17. Self-Assessment member organisation

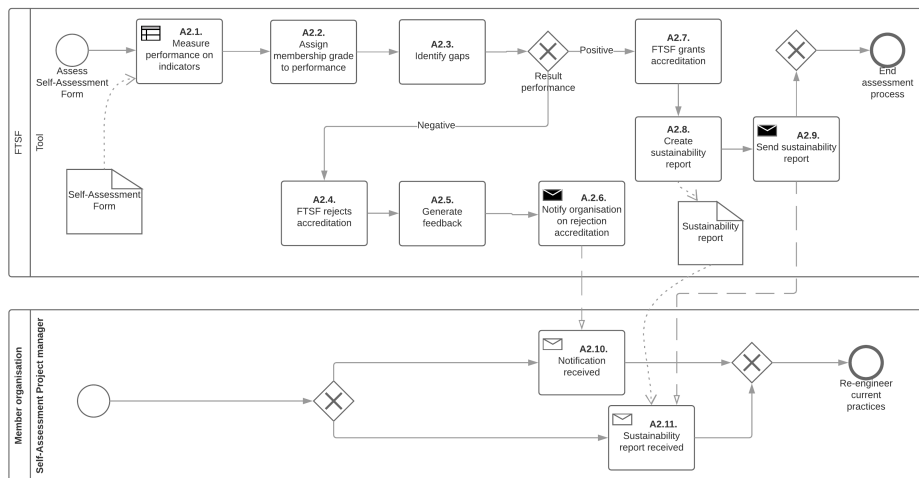


Fig. 18. FTSF tool assesses Self-Assessment Form

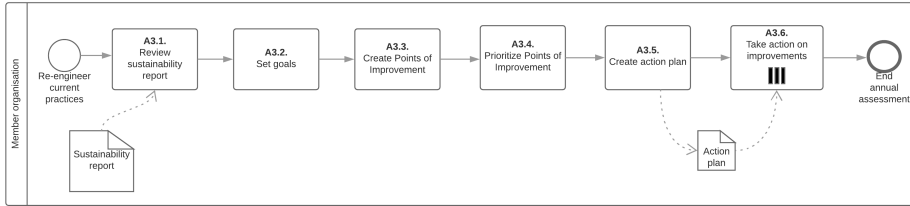


Fig. 19. Re-engineering of Fair Trade Software practices

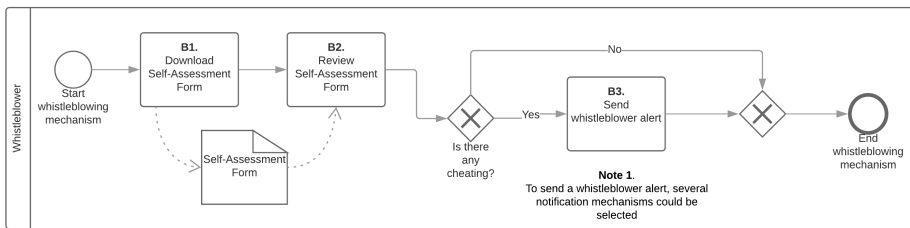


Fig. 20. Whistleblowing mechanism for cheating in FTS practices

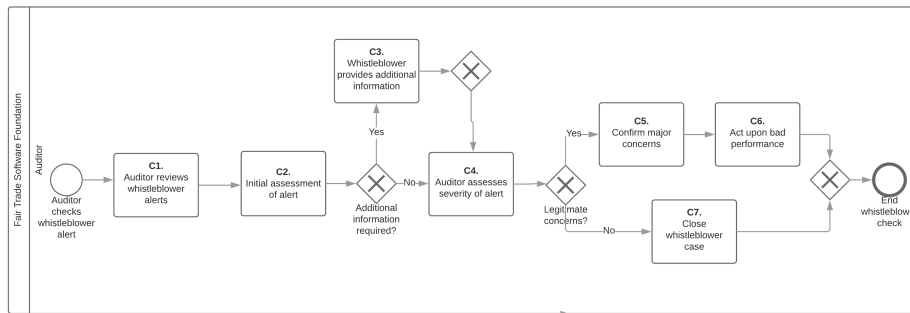


Fig. 21. FTSF check on whistleblower alerts

J Expert Assessment protocol

The Expert Assessment was conducted with representatives of the Fair Trade Software Foundation, whom are not only concerned on the creation of the method for accreditation but also a means for organisational assessment. Documentation and videos on the method, indicators, and the tool were sent beforehand to these representatives, so they were able to prepare themselves for the meeting. This saved a lot of time during the meeting that would else be spent explaining everything. With their consent, we recorded the conversation and made notes on the results of the discussion. The goal of the expert assessment was to validate our method. As a result of it, drawbacks could be identified and improvements could be made. After the improvements were made, several follow-up emails were exchanged for further validation.

The expert assessment has the following structure:

Overview An overview is given on what will be done during the expert assessment and what is to be expected from both parties.

1. Process First, the BPMN-Model of the method is discussed. Not every subprocess is as important as the other so the following is done:

- Overview model is shown and discussed. General feedback on the entirety of the method is asked.
- **A1:** The assessment subprocess is walked through quickly, as this is the responsibility of a member organisation and not the FTSF. General feedback is asked.
- **A2:** The check of the member organisation is the most important subprocess in the model, so this is explained and discussed thoroughly. The goal of the discussion is to find activities that should be changed, removed or inserted.
- **A3:** The audit of the member organisation is also an important one, but less urgent. This one is also walked through more generally, as it is most likely not achievable within the few next years.
- **A4:** The re-engineering is also walked through quickly, for the same reasons as A1. Only general feedback is asked.

Questions on process after discussion

1. What benefits do you see in the usage of this method?
2. What drawbacks do you see in the usage of this method?
3. Have we missed essential components for this method?
4. Would it be useable?
5. What would be needed for it to be useable?

2. Product

In the second part, the indicators are shown and discussed. For each indicator, questions 1 and 2 are asked and then any potential missing indicators are discussed.

Indicators

1. Is this indicator supposed to be a core one or an optional one?
2. Should this indicator be changed or removed?
3. Are there any indicators you feel we are missing in the list?

3. Tool

For this part, the openSEA tool is shown and discussed.

1. What is your opinion on the tool, would it be useful?
2. Do you have any requirements or features that would be useful for the tool?

Then, for the method validation, we used a validation matrix, as described by Deneckre et al. [12]

A validation matrix was constructed to indicate the number of changes on the BPMN-models (Table 17). An activity could either be removed, changed or a new one could be inserted. Then, for every change, it indicates whether the change is defined for the complete activity/indicator or part of it. The final row represents the motivation for the change.

As for the indicators and tool, a short summary is given on the results of the discussion on them.

Method change	Total	Removed	Changed	Inserted
<i>Total changes</i>				
<i>Complete</i>				
<i>Partial</i>				
<i>Motivation</i>				

Table 17. Validation matrix

K YAML model of indicators for openSEA

```
name: FTSF
version: 4
categories:
  P1:
    name: Employment creation
  P2:
    name: Transparency and accountability
  P3:
    name: Fair Trading Practices
  P4:
    name: Payment of fair price
  P5:
    name: Ensuring no child labour and forced labour
  P6:
    name: Commitment to non-discrimination , gender-equity
      , women s empowerment and freedom of association
  P7:
    name: Ensuring good working conditions
  P8:
    name: Providing capacity building
  P9:
    name: Promoting Fair Trade
  P10:
    name: Respect for the environment
  P11:
    name: Transforming lives
  P12:
    name: Enhance employability
  P13:
    name: Create sustainable opportunities
  P14:
    name: Grow capacity to participate in global business
  P15:
    name: Provide a social ROI
  P16:
    name: Giving back
metrics:
  empl_last_year:
    name: Employee count (last year)
    type: number
  empl_cur_year:
    name: Employee count (current year)
```

```

    type: number
empl_female:
    name: Employee count (female)
    type: number
empl_forced:
    name: Employee count (forced)
    type: number
    help: Amount of employees which are either forced or
          under the age of 15 without internship.
empl_local:
    name: Employee count (local)
    type: number
    help: Amount of local talent hired in offices in
          developing countries.
empl_lost:
    name: Employees lost
    type: number
    help: Amount of employees that have left your
          organisation over past year.
com_benefits:
    name: Community benefits
    type: text
    help: Whether your organisation uses its increased
          income and skills to benefit the wider community
          in its area using IT.
unit_mass:
    name: Unit mass (kilograms)
    type: number
    help: Average mass in kilograms of electronic items
          your organisation has in service.
unit_count:
    name: Unit count
    type: number
    help: Amount of electronic items your organisation
          has in service.
unit_lifespan:
    name: Unit lifespan (years)
    type: number
    help: Average lifespan of electronic items in years.
energy_total:
    name: Total energy consumed (kWh)
    type: number
gen_disclosure:
    name: General disclosure
    type: text

```


help: Provide consolidated annual reports of last 3
 years
 inf_employment:
 name: Informal employment
 type: text
 help: Provide outline on percentage of informal
 employment
 prim_functions:
 name: Primary functions
 type: text
 help: Provide explanation of how FTS fits in with the
 company business model with BMC
 mat_leave:
 name: Maternity leave
 type: number
 help: Amount of paid maternal leave days
 pat_leave:
 name: Paternity leave
 type: number
 help: Amount of paid paternal leave days
 ann_turnover:
 name: Annual turnover
 type: number
 help: Revenue made in current year
 avg_hours:
 name: Average working hours
 type: number
 help: Average working hours of the employees
 paid_holidays:
 name: Paid holidays
 type: number
 help: Amount of paid holiday days
 emp_creation:
 name: Employment creation
 type: number
 help: Indicate the amount of jobs that were created
 either directly or indirectly by your practices
 proj_success:
 name: Successful projects
 type: number
 help: Amount of projects that were successfully
 planned, executed and completed in a timely manner
 tot_project:
 name: Total amount of projects
 type: number

```

for_linkages :
  name: Forward linkages
  type: text
  help: Provide outline on forward linkages as a result
        of growth
paid_overtime :
  name: Paid overtime
  type: text
  help: Indicate whether employees are entitled to paid
        overtime
sick_days :
  name: Average amount of sick days for employees
  type: text
total_days :
  name: Total average working days for an employee
  type: text
loc_supplier :
  name: Local suppliers
  type: number
  help: Amount spent on local suppliers
tot_budget :
  name: Total procurement budget
  type: number
  help: Total amount of procurement budget
_transparency :
  name: Transparency
  type: text
  help: Provide outline on transparency between upper
        management and rest of employees
_corruption :
  name: Corruption
  type: text
  help: Provide outline on incidents of corruption and
        actions taken towards it
hr_policy :
  name: Human Resources policy
  type: text
  help: Provide outline on current HR policy
fin_practices :
  name: Financing practices
  type: text
  help: Provide outline on your financing practices
tax_payments :
  name: Tax payments
  type: text

```

help: Provide outline on the times tax payments were
 incorrectly fulfilled and why

crypto_policy:

- name: Cryptocurrency policy
- type: text
- help: Provide outline on your current cryptocurrency
 policy

download_policy:

- name: Downloading policy
- type: text
- help: Provide outline on your current downloading
 policy

agile_method:

- name: Agile methodologies
- type: text
- help: Provide outline on the adoption of Agile
 methodologies within the organisation

dom_projects:

- name: Domain of projects
- type: text
- help: Provide outline of [1-3] largest projects , with
 whom and what?

ethic_supply:

- name: Ethical supply management
- type: text
- help: Provide outline of [1-3] largest suppliers

ethic_financial:

- name: Ethical financial management
- type: text
- help: Provide outline of [1-3] largest investors

ethic_client:

- name: Ethical client management
- type: text
- help: Provide outline of [1-3] largest clients

wage_provision:

- name: Wage provision
- type: number
- help: Amount of complaints on wages not being
 provided on time

avg_female_pay:

- name: Average female wage
- type: number

avg_male_pay:

- name: Average male wage
- type: number

local_avg_wage :
 name: Local minimum wage
 type: number
 avg_wage_senior :
 name: Average wage of your senior-level employees
 type: number
 avg_wage_lower :
 name: Average wage of your lower-level employees
 type: number
 salary_difference :
 name: Percentual salary difference
 type: number
 inflation_rate :
 name: Percentual inflation rate
 type: number
 pay_handling :
 name: Payment handling
 type: text
 help: Provide outline on your payment handling practices
 empl_underage :
 name: Amount of underage employees
 type: number
 empl_female_exec :
 name: Amount of female executives
 type: number
 empl_exec_cur_year :
 name: Amount of executives in the current year
 type: number
 non_discrimination :
 name: Non-discrimination
 type: text
 help: Provide outline on complaints on discrimination and how this is handled
 non_intim :
 name: Non-intimidation
 type: text
 help: Provide outline on complaints on intimidation, abuse or coercion and how this is handled
 free_assoc :
 name: Freedom of association
 type: text
 help: Provide outline on any violations of freedom of association and actions taken
 cur_emp_diverse :

name: Current amount of employees with different
 ethnicity
 type: number
 emp_training_received:
 name: Ethical training
 type: number
 help: Amount of employees that received ethical
 training
 num_inspections:
 name: Inspections
 type: number
 help: Amount of inspections on safety measures
 emp_access:
 name: Facilitation access
 type: number
 help: Amount of employees with access to potable
 water, clean sanitary, and lunch food
 phys_environment:
 name: Physical work environment
 type: text
 help: Provide outline on lighting, heating and
 ventilation facilitation on indoor workplaces
 _satisfaction:
 name: Employee satisfaction
 type: text
 help: Provide outline on indications of overall
 satisfaction of employees and what is done to
 stimulate this
 evac_plan:
 name: Evacuation plan
 type: text
 help: Provide outline on the facilitation of escape
 routes, fire alarms and emergency exits
 num_accidents:
 name: Accidents
 type: number
 help: Amount of incidents happened on the workflow
 num_training:
 name: Training provision
 type: number
 help: Amount of employees trained
 num_safety_training:
 name: Safety and First aid training
 type: number

help: Amount of employees trained in safety measures
 and first aid

priv_breaches:

- name: Privacy breaches
- type: text
- help: Provide outline on incidents on workflow and
 amount of incidents from outside parties

data_loss:

- name: Loss of data
- type: text
- help: Provide outline on amount of incidents of leaks
 , theft , and loss of data

risk_management:

- name: Supply Chain Risk Management
- type: text
- help: Provide outline on current policy to minimize/
 mitigate security issues

fts_promotion:

- name: FTS promotion
- type: number
- help: Number of organisations directly or indirectly
 involved with an FTS project

academic_cooperation:

- name: Academic cooperation
- type: text
- help: Provide outline on academic cooperation you
 participate in

green_policy:

- name: Green policy
- type: text
- help: Provide outline on your green policy

power_cur_year:

- name: Power consumption current year
- type: number

power_prev_year:

- name: Power consumption previous year
- type: number

energy_total_it:

- name: Total power consumption of IT systems
- type: number

env_awareness:

- name: Environmental awareness
- type: text
- help: Provide outline of current initiatives to
 spread awareness on environmental protection

recycle_total:
 name: Total recycled trash
 type: number
 help: Amount of thrash that has been recycled in kg
 total_disposed:
 name: Total disposed trash
 type: number
 help: Amount of thrash that has been disposed in kg
 env_non_compliance:
 name: Environmental non-compliance
 type: text
 help: Provide outline of any monetary and/or non-monetary sanctions as a result of non-compliance
 human_violations:
 name: Human rights violations
 type: text
 help: Provide outline of any complaints or observations of human rights violation
 empl_pension:
 name: Amount of employees with pension plan
 type: number
 empl_review:
 name: Performance/development reviews
 type: number
 help: Amount of employees receiving reviews
 offsh_outsourcing:
 name: Offshore outsourcing
 type: text
 help: Provide outline on your offshore outsourcing practices
 sus_opportunities:
 name: Sustainable opportunities
 type: text
 help: Provide outline of engagement in subcontracting
 commit_csr:
 name: Commitment to CSR
 type: text
 help: Provide outline of any CSR initiatives company takes part in
 empl_healthcare:
 name: Amount of employees with health care
 type: text
 other_remarks:
 name: Other remarks
 type: text

help: Provide outline on any other initiatives that are worth mentioning or stimulate FTS practices
 energy_renewable:
 name: Amount of renewable energy consumed (kWh)
 type: number
 indicators:
 S1:
 name: Company profile
 description: General disclosure of the organisation
 category: P0
 type: text
 value: gen_disclosure
 S2:
 name: Legally binding contracts
 description: Percentage of staff with an employment contract, percentage of staff in developing countries employed as freelancers, subcontractors or other informal employment
 category: P0
 type: text
 value: inf_employment
 S3:
 name: Primary functions
 description: Indication of the primary functions and products/services of the organisation
 category: P0
 type: text
 value: prim_functions
 S4:
 name: Employees
 description: Amount of employees your organisation has at the moment of assessment.
 category: P0
 type: percentage
 value: $((\text{empl_cur_year} - \text{empl_last_year}) / \text{empl_last_year}) * 100$
 S5:
 name: Paid maternal leave
 description: Indication on amount of paid maternal leave an employee is entitled to
 category: P1
 type: number
 value: mat_leave
 S6:
 name: Annual turnover

description: The overall annual turnover of the
organisation
category: P1
type: number
value: ann_turnover
S7:
name: Labour turnover
description: Rate at which employees leave and are
replaced within your organisation.
category: P1
type: percentage
value: $(\text{empl_lost} / ((\text{empl_last_year} + \text{empl_cur_year}) / 2)) * 100$
S8:
name: Average working hours
description: Indication of average hours full time
employees are required to work according to their
contract
category: P1
type: number
value: avg_hours
S9:
name: Paid holiday days
description: Indication on amount of paid holiday
days an employee is entitled to
category: P1
type: number
value: paid_holidays
S10:
name: Paid paternal leave
description: Indication on amount of paid paternal
leave an employee is entitled to
category: P1
type: number
value: pat_leave
S11:
name: Employment creation
description: The amount of job opportunities created
due to FTS practices
category: P1
type: number
value: emp_creation
S12:
name: Local talent

description: Amount of local talent hired in offices
 in developing countries.
 category: P1
 type: percentage
 value: $(\text{empl_local} / \text{empl_cur_year}) * 100$

S13:
 name: Project success
 description: Rate at which projects have been planned
 , executed and completed in a timely manner
 category: P1
 type: percentage
 value: $(\text{proj_success} / \text{tot_project}) * 100$

S14:
 name: Forward linkages
 description: Indication on the amount of business
 that were created as a result of growth in
 developing country
 category: P1
 type: text
 value: for_linkages

S15:
 name: Paid overtime
 description: Indication on whether employees are
 entitled to paid overtime
 category: P1
 type: text
 value: paid_overtime

S16:
 name: Health rate
 description: Health/sickness rate of employees
 category: P1
 type: percentage
 value: $(\text{sick_days} / \text{total_days}) * 100$

S17:
 name: Local suppliers
 description: Percentage of procurement budget spent
 on suppliers local to a project
 category: P1
 type: percentage
 value: $(\text{loc_supplier} / \text{tot_budget}) * 100$

S18:
 name: Transparency
 description: Whether upper management adequately
 communicates with all its employees and includes
 them in decisions

category: P2
type: text
value: _transparency

S19:
name: Corruption
description: Amount of identified incidents of
corruption within the organisation
category: P2
type: text
value: _corruption

S20:
name: Human Resources policy
description: Whether an adequate policy is put in
place on HR
category: P2
type: text
value: hr_policy

S21:
name: Financing practices
description: Whether the organisation have sufficient
financing practices
category: P2
type: text
value: fin_practices

S22:
name: Tax payments
description: Whether the organisation fulfill their
tax payments in a correct and timely manner
category: P2
type: text
value: tax_payments

S23:
name: Cryptocurrency policy
description: Whether an adequate policy is in place
on the mining/trading of cryptocurrencies
category: P2
type: text
value: crypto_policy

S24:
name: Downloading policy
description: Whether an adequate policy is in place
on illegal downloading
category: P2
type: text
value: download_policy

S25:
name: Agile methodologies
description: Indication on the adoption of Agile methodologies within an organisation
category: P3
type: text
value: agile_method

S26:
name: Domain of projects
description: Indication of type of business an organisations creates revenue with, whether in line with FTS values
category: P3
type: text
value: dom_projects

S27:
name: Ethical supply management
description: Indication of ethical, social and ecological aspects of largest suppliers, whether in line with FTS values
category: P3
type: text
value: ethic_supply

S28:
name: Ethical financial management
description: Indication of ethical, social and ecological aspects of largest investors, whether in line with FTS values
category: P3
type: text
value: ethic_financial

S29:
name: Ethical client management
description: Indication of ethical, social and ecological aspects of largest clients, whether in line with FTS values
category: P3
type: text
value: ethic_client

S30:
name: Wage provision
description: Whether the company provides wages in a regular and timely manner
category: P4
type: number

value: wage_provision

S31:
name: Equal pay men and women
description: Difference between the average wage of men and women in same positions
category: P4
type: percentage
value: $(\text{avg_female_pay} / \text{avg_male_pay}) * 100$

S32:
name: Minimum wage
description: Difference between average wage for lower-level employees and the local minimum wage
category: P4
type: percentage
value: $(\text{avg_wage_lower} / \text{local_avg_wage}) * 100$

S33:
name: Pay gap
description: Difference in average wages between lower-level employees and senior managers
category: P4
type: percentage
value: $(\text{avg_wage_lower} / \text{avg_wage_senior}) * 100$

S34:
name: Spending power
description: Indication on whether salaries increase when inflation does
category: P4
type: number
value: $\text{salary_difference} - \text{inflation_rate}$

S35:
name: Payment handling
description: Indication on the way an organisation handles its payments
category: P4
type: text
value: pay_handling

S36:
name: Forced or child labour
description: Ratio of employees which are either forced or under 15 without internship.
category: P5
type: percentage
value: $(\text{empl_forced} / \text{empl_cur_year}) * 100$

S37:
name: Underaged hazardous work

description: Amount of employees under 18 exposed to
hazardous work
category: P5
type: percentage
value: (empl_underage / empl_cur_year) * 100
S38:
name: Female employee distribution
description: Amount of females employed at your
organisation.
category: P6
type: percentage
value: (empl_female / empl_cur_year) * 100
S39:
name: Female executives
description: Amount of females employed at an
executive position at an organisation.
category: P6
type: percentage
value: (empl_female_exec / empl_exec_cur_year) * 100
S40:
name: Non-discrimination
description: With a grievance procedure in place,
indication of the severity of discrimination on
workfloor
category: P6
type: text
value: non_discr
S41:
name: Non-intimidation
description: With a grievance procedure in place,
indication of the severity of coercion, abuse and
intimidation on workfloor
category: P6
type: text
value: non_intim
S42:
name: Freedom of association
description: Indication of violations of a worker's
right to exercise freedom of association
category: P6
type: text
value: free_assoc
S43:
name: Diversity rate

description: Rate of employees with a different
ethnicity/tribe than the country/tribe
organisation resides in/consists of
category: P6
type: percentage
value: $(\text{cur_emp_diverse} / \text{empl_cur_year}) * 100$

S44:
name: Ethical training
description: Amount employees receiving training on
sexual harassment, violations, abuse,
discrimination or corruption
category: P6
type: percentage
value: $(\text{emp_training_received} / \text{empl_cur_year}) * 100$

S45:
name: Inspection rate
description: Rate at which company premises is
inspected on safety measures of equipment, wiring,
outlets, leakage and other hazards
category: P7
type: number
value: num_inspections

S46:
name: Facilitation access
description: Rate of employees that have access to
potable water, clean sanitary, and refrigeration
facilities / lunch food
category: P7
type: percentage
value: $(\text{emp_access} / \text{empl_cur_year}) * 100$

S47:
name: Physical work environment
description: Whether indoor workplaces have adequate
lighting, heating and ventilation in context of
local weather conditions
category: P7
type: text
value: phys_environment

S48:
name: Overall satisfaction rate
description: Indication of overall satisfaction of
employees
category: P7
type: text
value: _satisfaction

S49:
name: Evacuation plan
description: Whether working environment is equipped with fire exits , escape routes , fire alarms etc .
category: P7
type: text
value: evac_plan

S50:
name: Accidents
description: Amount of accidents occurring on the workflow
category: P7
type: number
value: num_accidents

S51:
name: Training provision
description: Indicates amount of employees trained in management and professional skills
category: P8
type: number
value: num_training

S52:
name: Safety / First aid training
description: Rate of employees receiving basic training in safety , first aid and occupational health
category: P8
type: percentage
value: (num_safety_training / empl_cur_year) * 100

S53:
name: Privacy breaches
description: Amount of identified incidents concerning breaches of privacy of employees
category: P8
type: text
value: priv_breaches

S54:
name: Loss of data
description: Amount of incidents concerning leaks , thefts and loss of data
category: P8
type: text
value: data_loss

S55:
name: Supply Chain Risk Management

description: Whether an adequate policy is in place
to minimize risk of cybersecurity
category: P8
type: text
value: risk_management

S56:
name: FTS promotion
description: Whether an organisation's affiliation
with the FTSE has spread awareness of the
organisation
category: P9
type: number
value: fts_promotion

S57:
name: Academic cooperation
description: Whether the organisation actively works
together with universities or academic facilities
to enhance FTS related knowledge
category: P9
type: text
value: academic_cooperation

S58:
name: Green policy
description: Indication on the green policy an
indication has put in place
category: P10
type: text
value: green_policy

S59:
name: Power consumption
description: Difference in power consumption compared
to previous years
category: P10
type: percentage
value: $((\text{power_cur_year} - \text{power_prev_year}) / \text{power_prev_year}) * 100$

S60:
name: Renewable energy rate
description: Measures ratio of energy which is
renewable energy.
category: P10
type: percentage
value: $(\text{energy_renewable} / \text{energy_total}) * 100$

S61:
name: E-waste

description: Measures contribution to the annual E-
waste production in kg/year.
category: P10
type: number
value: $((\text{unit_mass} * \text{unit_count}) / \text{unit_lifespan}) * 100$

S62:
name: Environmental awareness
description: Whether the organisation takes steps to
inform its employees on environmental policies and
protection
category: P10
type: text
value: env_awareness

S63:
name: Power Usage Effectiveness
description: Measures rate IT equipment power
consumption compared to overall power consumption
category: P10
type: percentage
value: $\text{energy_total} / \text{energy_total_it}$

S64:
name: Recycling waste
description: Ratio of disposed trash which is
recycled or at least recyclable
category: P10
type: percentage
value: $\text{recycle_total} / \text{total_disposed}$

S65:
name: Environmental non-compliance
description: Indication of fines and sanctions for
non-compliance with environmental regulations and
laws
category: P10
type: text
value: env_non_compliance

S66:
name: Human rights violations
description: Amount of identified incidents of
violations of human rights
category: P11
type: text
value: human_violations

S67:
name: Pension fund

description: Rate of employees with a pension plan
 put in place
 category: P11
 type: percentage
 value: (empl_pension / empl_cur_year) * 100

S68:
 name: Performance/development review
 description: Rate of employees receiving performance
 and career development reviews
 category: P12
 type: percentage
 value: (empl_review / empl_cur_year) * 100

S69:
 name: Offshore outsourcing
 description: Indication on whether an organisation
 outsources its functions offshore or Impact
 Sourcing
 category: P13
 type: text
 value: offsh_outsourcing

S70:
 name: Sustainable opportunities
 description: Indication of organisation engaging in
 subcontracting which prevents transparency
 category: P13
 type: text
 value: sus_opportunities

S71:
 name: Commitment to CSR
 description: Whether an organisation commits to
 promote and enhance their Corporate Social
 Responsibility
 category: P15
 type: text
 value: commit_csr

S72:
 name: Health care
 description: Rate of employees with adequate health
 care
 category: P15
 type: percentage
 value: (empl_healthcare / empl_cur_year) * 100

S73:
 name: Community benefits

description: Whether your organisation uses its increased income and skills to benefit the wider community in its area using IT.

category: P16

type: text

value: com_benefits

S74:

name: Other remarks

description: Any other remarks concerning initiatives stimulating FTS practices

type: text

value: other_remarks

reportItems:

- name: Employee growth
value: S4
- name: Informal employment
value: S2
- name: Paid maternal leave
value: S5
- name: Paid paternal leave
value: S10
- name: Paid holiday days
value: S9
- name: Health rate
value: S16
- name: Labour turnover
value: S7
- name: Local talent
value: S12
- name: Project success rate
value: S13
- name: Pension fund
value: S67
- name: Forced or child labour
value: S36
- name: Female employee distribution
value: S38
- name: Female executive distribution
value: S39
- name: Renewable energy rate
value: S60
- name: Diversity rate
value: S43
- name: E-waste
value: S61

```

- name: Community benefits
  value: S73
certifications:
- name: Bronze
  colour: "#cd7f3d"
  requirements:
    - indicator: S2
      operator: "<"
      value: 30
    - indicator: S5
      operator: ">="
      value: 50
    - indicator: S8
      operator: "<"
      value: 45
    - indicator: S9
      operator: ">="
      value: 15
    - indicator: S10
      operator: ">="
      value: 0
    - indicator: S13
      operator: ">="
      value: 50
    - indicator: S16
      operator: "<"
      value: 7
    - indicator: S38
      operator: ">"
      value: 10
    - indicator: S39
      operator: ">"
      value: 0
    - indicator: S67
      operator: ">"
      value: 90
    - indicator: S43
      operator: ">="
      value: 0
    - indicator: S36
      operator: "=="
      value: 0
    - indicator: S12
      operator: ">"
      value: 80

```

```
- name: Silver
  colour: "#9aa6b2"
  requirements:
    - indicator: S2
      operator: "<"
      value: 20
    - indicator: S5
      operator: ">="
      value: 80
    - indicator: S8
      operator: "<"
      value: 45
    - indicator: S9
      operator: ">="
      value: 20
    - indicator: S10
      operator: ">="
      value: 1
    - indicator: S13
      operator: ">="
      value: 75
    - indicator: S16
      operator: "<"
      value: 5
    - indicator: S38
      operator: ">"
      value: 25
    - indicator: S39
      operator: ">"
      value: 5
    - indicator: S36
      operator: "=="
      value: 0
    - indicator: S43
      operator: ">"
      value: 20
    - indicator: S67
      operator: ">"
      value: 95
    - indicator: S12
      operator: ">"
      value: 90
- name: Gold
  colour: "#c6a82c"
  requirements:
```

- indicator: S2
operator: "<"
value: 10
- indicator: S5
operator: ">="
- indicator: S8
operator: "<"
value: 40
- indicator: S9
operator: ">="
- indicator: S10
operator: ">="
- indicator: S13
operator: ">"
- indicator: S16
operator: "<"
- indicator: S38
operator: ">"
- indicator: S43
operator: ">"
- indicator: S39
operator: ">"
- indicator: S67
operator: "=="
- indicator: S36
operator: "=="
- indicator: S12
operator: ">"

L Screenshots openSEA tool

The screenshot shows the 'Data' entry interface for the year 2018. A vertical sidebar on the left contains navigation icons: a home icon, a search icon, a plus sign, a hexagon, a document, a bar chart, a gear, a question mark, and a user profile. The main content area is titled 'Data' and shows a breadcrumb path 'Beepr solutions / Reports / 2018'. The indicators and their values are as follows:

Indicator	Description	Value
Community benefits	We have organised several events introducing	
	Whether your organisation uses its increased income and skills to benefit the wider community in its area using IT.	
Employee count (current year)		70
Employee count (female)		20
Employee count (forced)		0
	Amount of employees which are either forced or under the age of 15 without internship.	
Employee count (last year)		65
Employee count (local)		20
	Amount of local talent hired in offices in developing countries.	
Employees lost		4
	Amount of employees that have left your organisation over past year.	
Amount of renewable energy consumed (kWh)		1200
Total energy consumed (kWh)		

Fig. 22. Data entry screen of indicators

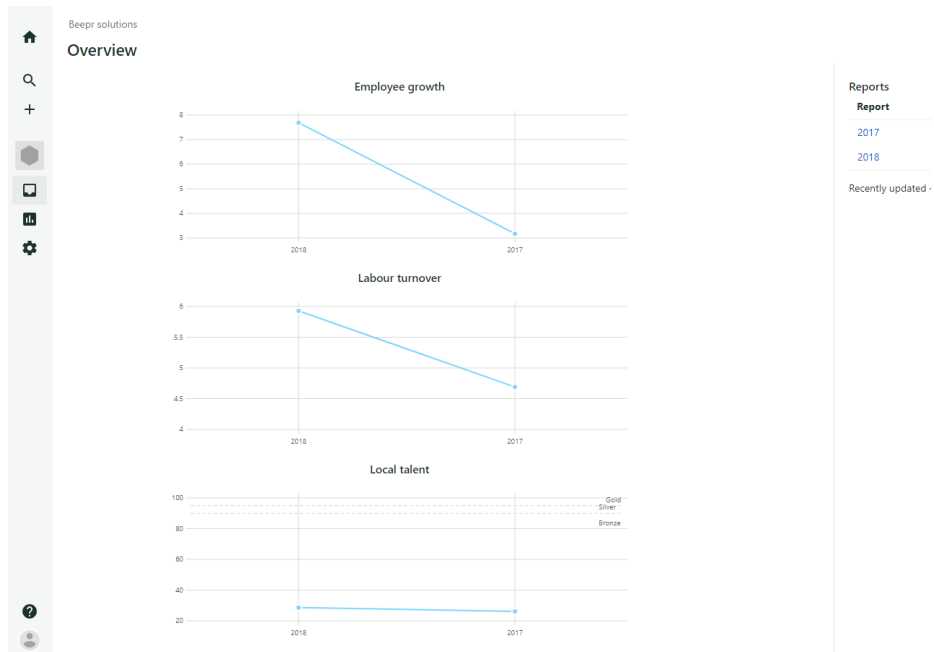


Fig. 23. Overview report of entered data over the years

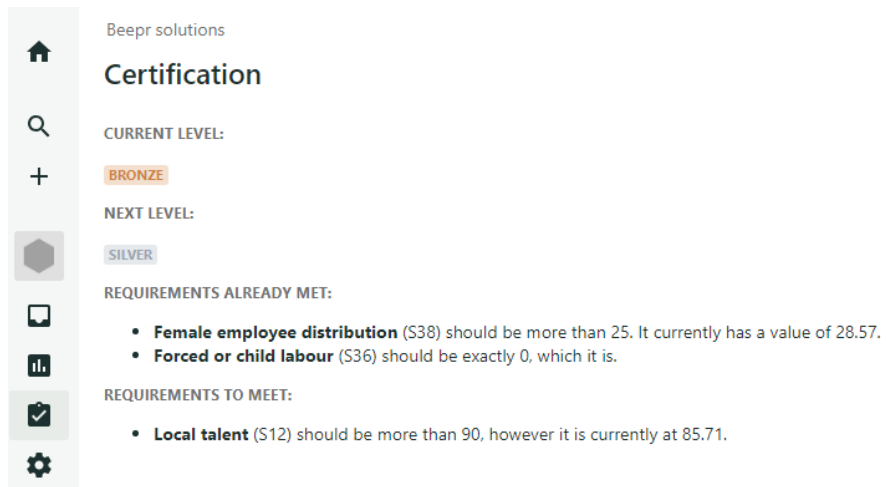


Fig. 24. Certification level screen and identified gaps

2018

EMPLOYEE GROWTH

7.69%

LABOUR TURNOVER

5.93%

LOCAL TALENT

85.71%

FORCED OR CHILD LABOUR

0%

FEMALE EMPLOYEE DISTRIBUTION

28.57%

RENEWABLE ENERGY RATE

85.71%

E-WASTE

33333.33

COMMUNITY BENEFITS

We have organised several events introducing children of ages 12-16 to code development.

Fig. 25. Overview of a single year's report

M Infographic



Fig. 26. Infographic to summarise this research 1/4



Fig. 27. Infographic to summarise this research 2/4

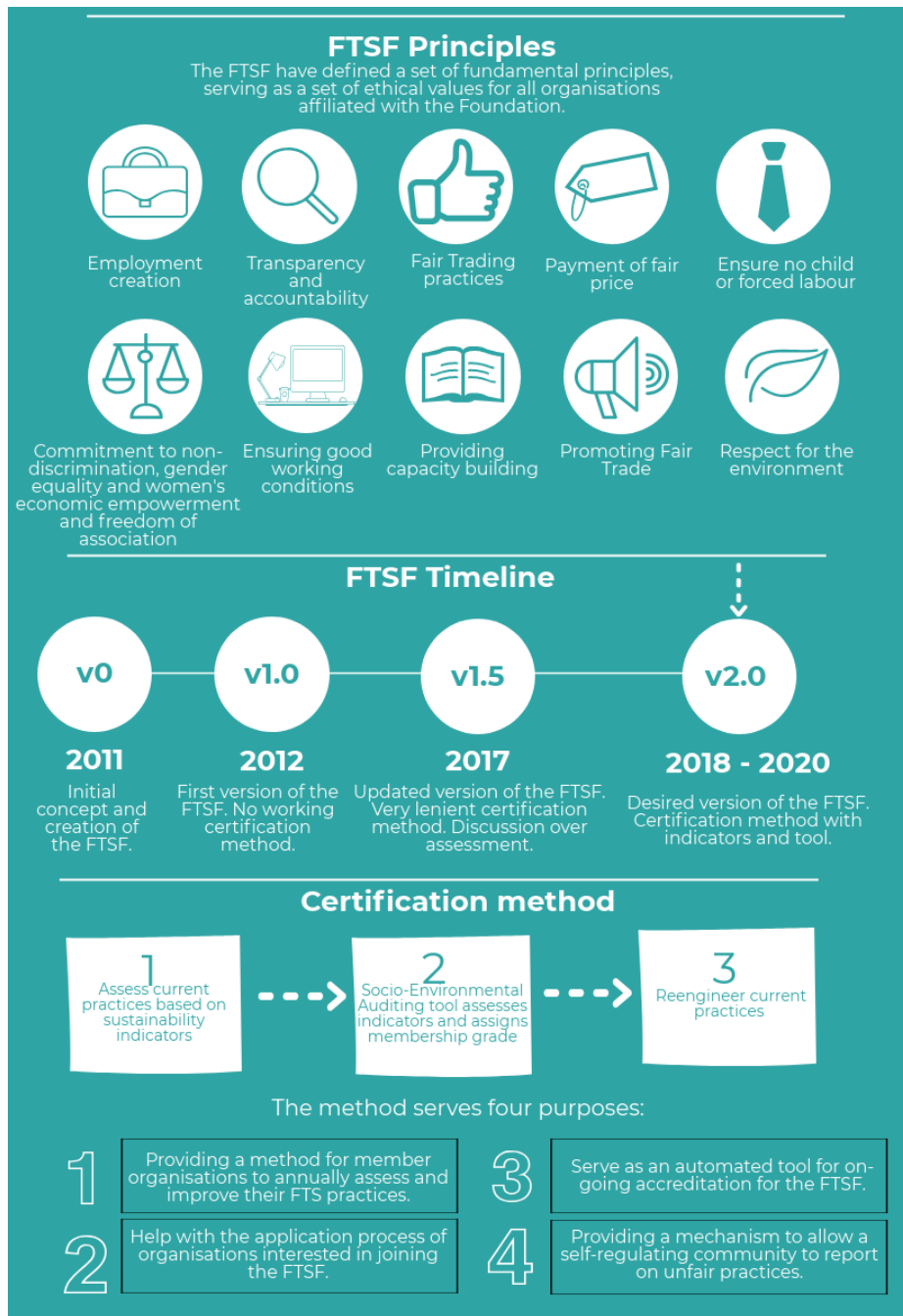


Fig. 28. Infographic to summarise this research 3/4

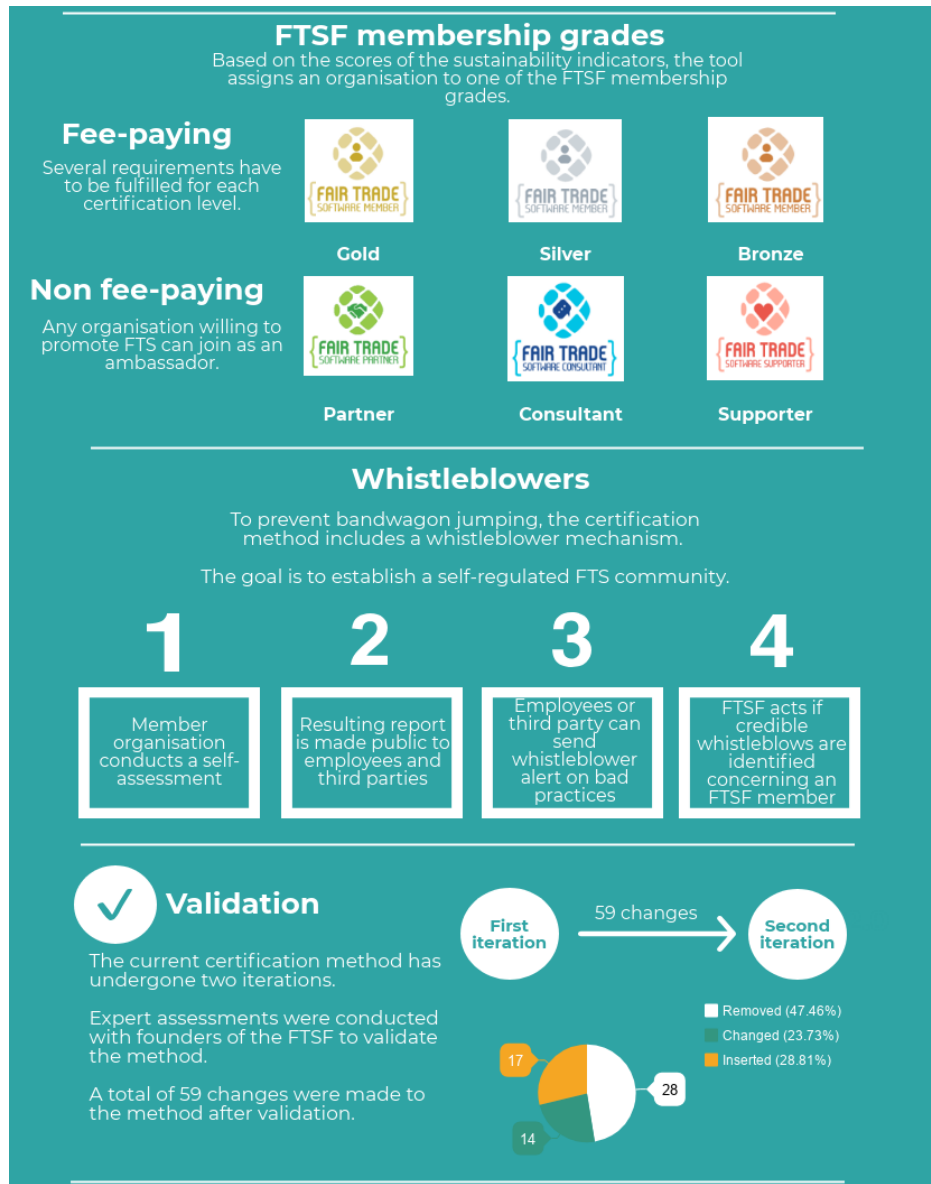


Fig. 29. Infographic to summarise this research 4/4