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Environmentally friendly electronic invoice





Executive summary

Electronic invoicing allows businesses to be green, productive and service-oriented. An electronic invoice is on average four times more environmentally friendly than a paper invoice. It saves a considerable amount of work time, which reduces emissions and also improves overall productivity. The working methods of an individual employee therefore affect the carbon footprint of the whole company.

Carbon footprint is currently the most popular measure for environmental friendliness. Its usability is excellent because it is easy to interpret and compare.



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Federation of Finnish Financial Services

**Environmentally friendly
electronic invoice**



Scope and objectives

This study seeks to examine the environmental benefits of electronic invoicing from the point of view of small and medium enterprises (SMEs). It has already been established that electronic invoicing improves productivity and the quality of service compared to traditional paper invoicing. This report will compare these invoicing systems in terms of their carbon footprint.

The study focuses on the movements of traditional paper invoices and electronic invoices (incoming and outgoing) in SMEs. The invoices are examined from the perspective of the whole process as well as in terms of the lifecycle of individual invoices. The handling process of an outgoing invoice starts with its drafting and with an incoming invoice the process starts when the invoice is received. In both cases the process ends with the disposal of the invoice after it has been archived for the statutory period of six years. To make the example as applicable to the activities of a small entrepreneur as possible, a small company was selected as the case company in the study.

Participants

The project was commissioned by the Federation of Finnish Financial Services, whose Corporate Social Responsibility division made an initiative to research the environmental impact of invoicing. Carbon footprints were calculated by Natural Interest Ltd, a Finnish climate expertise company. Process mapping and pilot study were conducted by the Real-Time Economy Program (RTE) from the Aalto University School of Economics. The Federation of Finnish Enterprises (FFE) recommended the container sales and leasing company Finncontainers Ltd for a case company in the study. The State Treasury represents a large agency and a typical co-operation partner for SMEs.

The project group consisted of representatives from the aforementioned organizations:

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This report was written by Jonne Hellgren and Maija Tenhunen.



Online invoicing and environmental responsibility in SMEs

A structured online invoice, such as the Finvoice, is a good example of environmentally sustainable solutions that SMEs can employ while dealing with the challenges of modern business. The best green solutions are beneficial not only for the environment, but also for companies, as they are cost-effective ways to respond to the needs of customers.

Environmental responsibility in SMEs

Ecological analysis has made progress, and today it is possible to assess the concrete distribution of environmental impact quite effortlessly even for small enterprises. Calculations such as the carbon footprint make it easier to understand how a green office solution or the use of online invoicing in a small enterprise could benefit the environment. As an offset from this SMEs can also be imposed with expectations to use environmentally friendly methods. Online invoicing makes possible the practice of environmentally friendly and sustainable business, where environmental values and objectives are tied in with the operations of the enterprise. In this way the environment friendly actions can also be evaluated financially. Applications such as online invoicing also improve the image of the enterprise both ecologically and commercially.

Overview of the online invoicing in SMEs

The SMEs which have become interested in the cost-benefits of online invoicing typically use PDF format for their invoices. They consider it an adequate, cost-efficient solution which avoids the costs that banks and operators charge for their online invoicing services. Another advantage SMEs have reported is the speed-up of payments¹. However, PDF invoicing falls short on the most substantial advantages of systematic electronic invoicing. A structured format will enable the automated transmission of information throughout the value chain with fewer mistakes, and this will speed up financial administration and notably reduce the amount of manual work.

Process mapping

In order to assess the carbon footprint for Finncontainers², the company's invoicing was mapped thoroughly. This consisted of mapping the handling processes of incoming and outgoing invoices, both paper and electronic. The lifecycle of an individual invoice was also mapped by combining the processes, in order to assess the carbon footprint of an individual invoice. Part of the process mapping consisted of operation analysis in the case company, so that the time consumed by the handling of invoices could be precisely measured. The following flowcharts illustrate the stages of the invoicing processes and the effects that switching to electronic invoicing had.

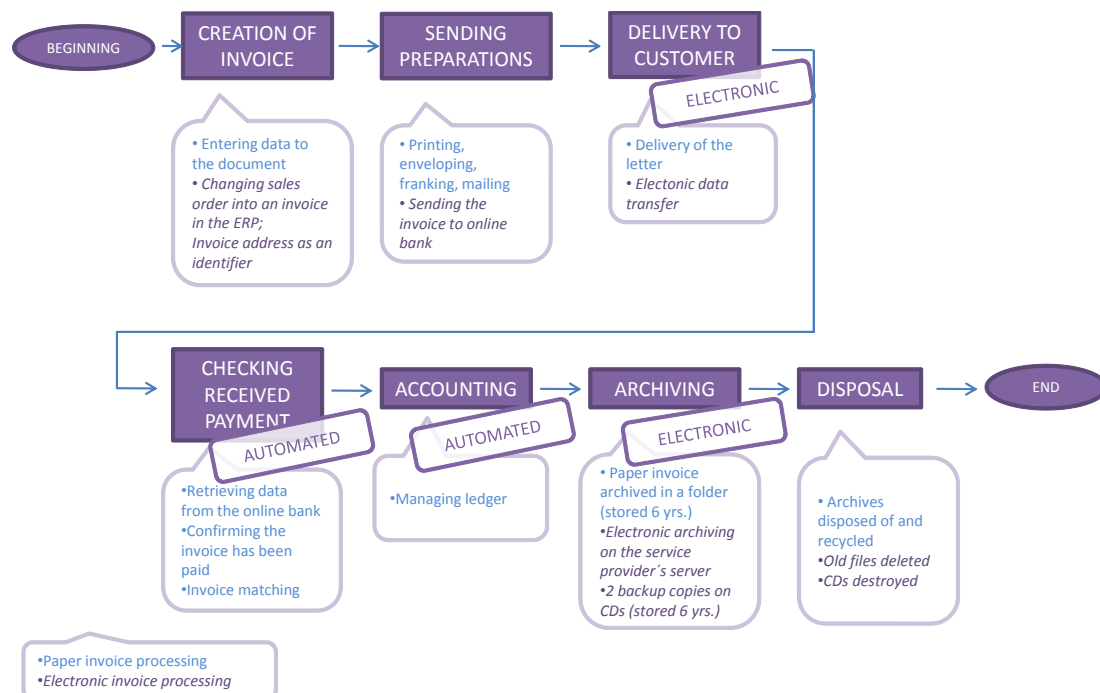
¹ Sähköisen laskun käyttö P&K -yrityksissä 2008. Helsinki: Federation of Finnish Enterprises.

² The handling of incoming paper invoices has been optimised at Finncontainers, e.g. by using barcode readers. Because of this, the time estimate given for the handling of paper invoicing is, in this study, near the sample minimum of the statistical range, compared to other similar studies.



Electronic invoicing changes the handling of an outgoing invoice at every stage of the process. Instead of the manual drafting of an invoice, the information from an electronic order is transformed into an invoice in the system. Similarly, instead of printing out the invoices and mailing them in envelopes, the invoices are sent to the company's online bank, where they are then transferred on to the recipient. At this point the sender of the invoice has completed the manual work that is required in the process: the subsequent stages such as matching and ledger management are automated, and the invoices are archived digitally on the server and on CDs. At the end of the process the electronic invoices are deleted, whereas paper invoices are recycled. The handling of an outgoing invoice is illustrated in figure 1. The figure shows the handling stages for both kinds of invoices, as well as those stages which are automated in electronic invoicing.

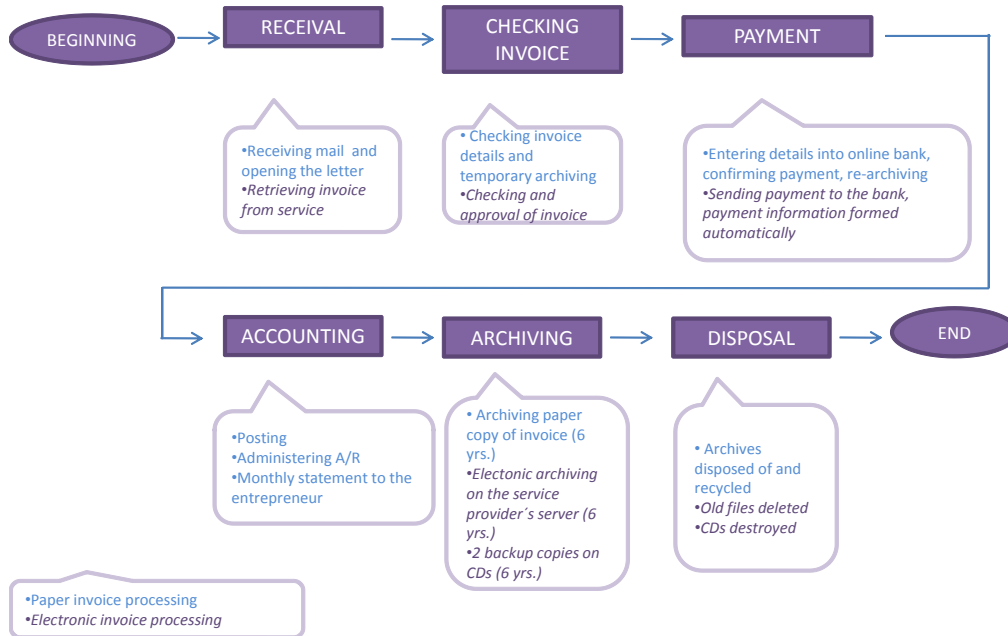
Figure 1: Outgoing invoice handling process



The handling process of an incoming invoice is also different in electronic invoicing. Instead of receiving and opening a letter, the electronic invoice is retrieved from the service and checked. Due to the rationalised working methods employed at Finncontainers, invoices were paid in batches instead of immediately upon the arrival of each invoice. In electronic invoicing the invoice is validated immediately after it has been checked, and the payment is sent to the bank, where it is processed and paid on the set due date. Payment information is formed automatically during this process. The whole stage which in paper invoicing required an accountant, who would post the payment to the ledger and submit a monthly profit and loss account to the entrepreneur, is fully automated in electronic invoicing. Incoming electronic invoices are archived and disposed of like outgoing electronic invoices. The handling process for incoming invoices is outlined in figure 2 below.

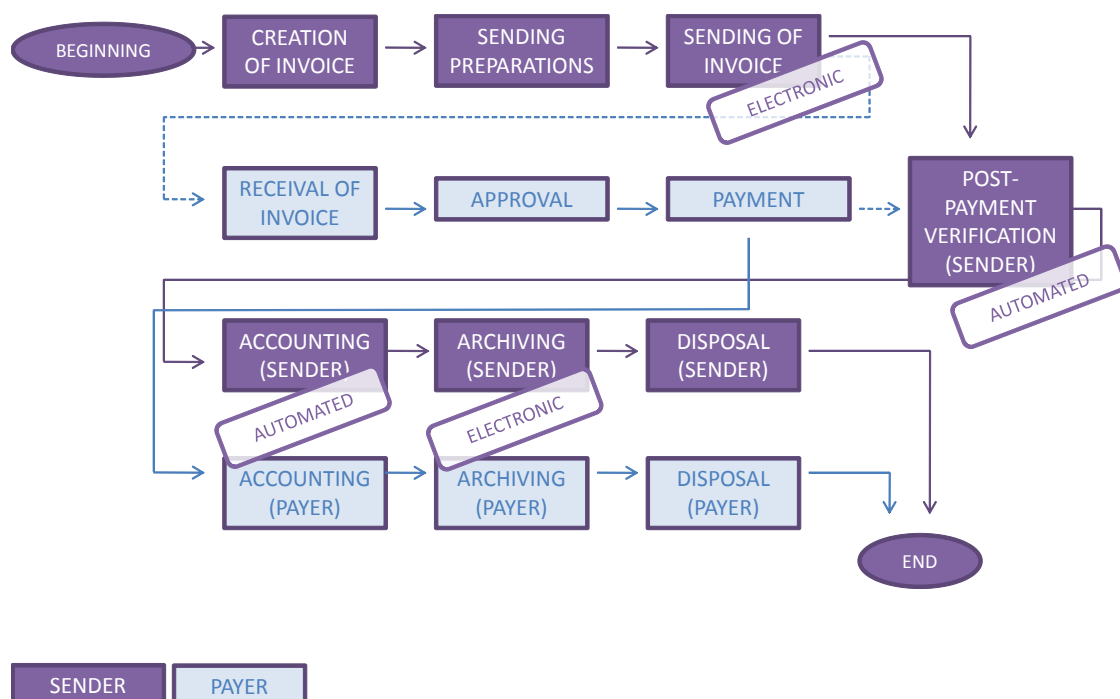


Figure 2: Incoming invoice handling process



It is possible to establish the lifecycle of an individual invoice by combining the incoming and outgoing processes. A lifecycle represents the full profile of a product or service, which therefore makes its carbon footprint relevant information. The complete lifecycle of paper and electronic invoices is outlined in figure 3. The figure also shows the stages which are automated in electronic invoicing.

Figure 3: Invoice lifecycle



**Service and productivity increases of electronic invoicing**

Switching to electronic invoicing frees resources and as a result improves productivity and service. At the case company Finncontainers the handling of one electronic invoice takes only half as long as the handling of a paper invoice (Table 1). The time that has been freed up can be directly used for example on customer service. The salespersons who are in charge of invoicing have also reported that they feel their work has become more meaningful with the reduced amount of manual work. Switching completely to electronic invoicing will also reduce the time entrepreneurs spend on administrative tasks, which can greatly benefit their well-being and time management, especially if they operate a family business. Online services stimulate customers' engagement, which means electronic operations can also be a trump card in the competition for new customers.

Table 1: Productivity: Change in work time after adopting electronic invoicing

	Time		Saved	
	Paper invoice	Electronic invoice	Min	%
Outgoing	8 min 51 s	5 min	3 min 51 s	43.50%
Incoming	3 min	1 min 30 s	1 min 30 s	50.00%

The amount of saved time grows substantially when the volume of processed invoices rises higher. Finncontainers annually receives 840 purchase invoices and sends 1,310 sales invoices, which means that if all of the invoices are electronic, the gain amounts to 105 hours per year. In a small enterprise, where the same employee will invoice his or her own sales, the gained hours can be used for example on other tasks or further sales. Different volumes of invoices and the time saved for each are presented as hours in table 2 below.

Table 2: Productivity: Number of invoices and time saved as hours

Number of invoices and time saved as hours							
Number of invoices	500	700	1,000	5,000	10,000	50,000	100,000
Saved time (h) in outgoing invoices	32	45	64	321	642	3,208	6,417
Saved time (h) in incoming invoices	13	17.5	25	125	250	1,250	2,500

Carbon footprint

Carbon footprint is currently the most popular measure of environmental impact. It is widely used to assess carbon emissions both on a national level as well as for specific entities such as private persons, individual companies and products. The term is usually used to refer to the amount of greenhouse gas emissions that are produced during the lifecycle of a product or activity. Carbon footprint does not cover the full scale of environmental effects, but focuses only on how these emissions affect climate change.

There is some variation in what the term carbon footprint is specifically used to represent. It can refer solely to direct carbon dioxide emissions (e.g. from energy development and motor vehicles) or indirect



carbon dioxide emissions (e.g. from the manufacturing process of a car) or both of these. Moreover, the carbon footprint can represent either carbon dioxide emissions alone, or all greenhouse gases as CO₂ equivalents. The CO₂ equivalents are calculated from the other greenhouse gases by measuring their climate warming impact in comparison to carbon dioxide.

Carbon footprints are expressed as mass. According to the context the figure is given either in metric tonnes, kilograms or grams.

The strong point of carbon footprinting lies in the fact that the figure is easy to interpret and compare. It is easy to identify the main sources of emissions because the carbon footprints of different products are directly comparable data that summarizes their environmental effects. This allows the more efficient targeting of resources, which helps cut emissions and therefore reduce costs as well. The simplicity of the carbon footprint makes it a useful tool that can be applied in both internal and public communications.

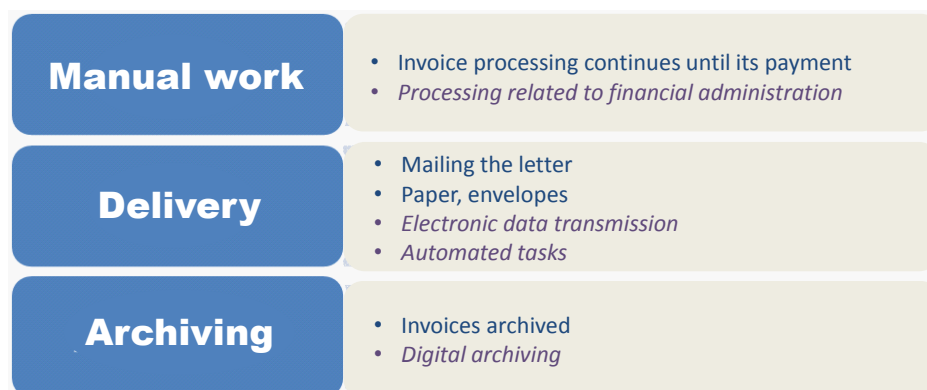
It is not possible to moderate global warming without reliable and comparable measuring instruments. A well-defined carbon footprint makes equal measurement possible, and its results are always reproducible.

Carbon footprint of invoicing

An electronic invoice is on average four times as environmentally friendly as a paper invoice. The carbon footprint of a single electronic invoice can be as small as 150 grams, whereas for a paper invoice the same figure is 450 grams. Somewhat surprisingly, however, the difference cannot be ascribed to the amount of saved paper or the automation of delivery. Instead, most of the difference is the result of improved work efficiency due to time saving and the resulting emission savings.

To calculate carbon footprints, the invoicing stages were divided into three categories. The figure below illustrates the procedures of traditional and electronic invoices

Figure 4: Invoice handling procedures in the calculation of carbon footprint



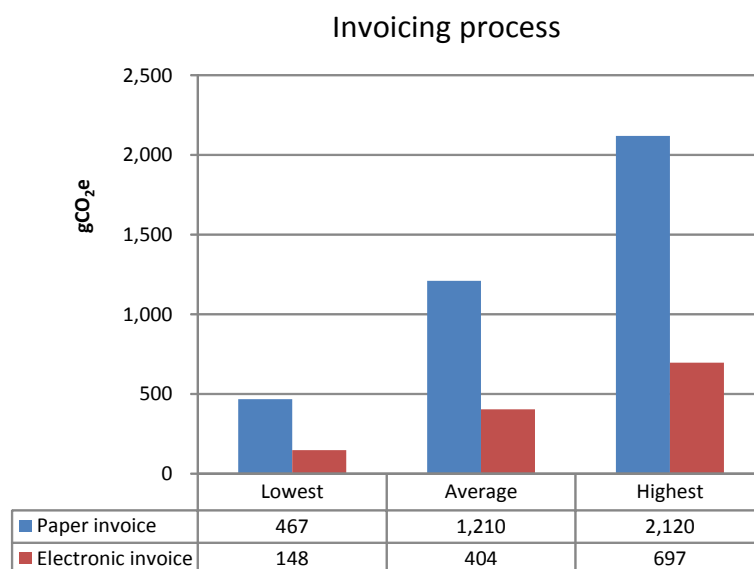
³ <http://www.ieta.org/ieta/www/pages/index.php?IdSitePage=123>

⁴ The carbon footprints of an electronic invoice (150g) and a paper invoice (450g) correspond with 1 and 3 kilometres' drive in a passenger car.



An electronic invoice is roughly four times as environmentally friendly both for outgoing and incoming invoices. The lowest carbon footprint is possible in a highly eco-efficient office environment where yearly carbon dioxide emissions are approximately 2 tonnes per employee. The largest carbon footprint – carbon dioxide emissions which average 10 tonnes per employee each year – belongs to ecologically inefficient offices, typically found in large companies. The arithmetic mean is based on the average carbon footprint of 6 tonnes per employee each year. A comparison of the differences between the lowest, highest and average emissions is presented for paper and electronic invoicing in figure 5 below.

Figure 5: Carbon footprint of an invoice on different levels of emissions (gCO₂eq / invoice)



Tables 3, 4 and 5 show the compared carbon footprints of an individual paper and electronic invoice. The carbon footprint of a traditional paper invoice varies between 500 and 2,000 gCO₂ (grams of carbon dioxide) per invoice. On the most efficient level, an electronic invoice produces a carbon footprint of only 150 grams. The figures in the tables contain both incoming and outgoing invoices.

Table 3: Comparison of carbon footprints on lowest level of emissions gCO₂eq

Lowest	Manual work	Delivery	Archiving	Total
Paper invoice	275	173	19	467
Electronic invoice	142	6	0	148

Table 4: Comparison of carbon footprints on average level of emissions gCO₂eq

Average	Manual work	Delivery	Archiving	Total
Paper invoice	790	350	71	1,210
Electronic invoice	398	6	0	404

**Table 5:** Comparison of carbon footprints on highest level of emissions gCO₂eq

Highest	Manual work	Delivery	Archiving	Total
Paper invoice	1,380	583	157	2,120
Electronic invoice	691	6	0	697

When the calculations are based on the average level of emissions, the emissions of a single electronic invoice are reduced to less than half of the emissions of a paper invoice (Table 6). As printing, franking, paper, envelopes and mail delivery are all combined in one online transaction, the largest amount of savings converge on delivery. The emissions from archiving are also cut nearly completely.

Table 6: Average carbon footprint of an outgoing paper invoice / outgoing electronic invoice, gCO₂eq

Outgoing invoice	Manual work	Delivery	Archiving	Total
Paper invoice	446	306	35	788
Electronic invoice	304	3	0	307

Proportionally the best emission reduction is achieved if the company changes to electronic processing of incoming invoices. In this case the emissions shrink to one quarter from the emissions of a paper invoice. Most of this improvement is due to the reduced amount of manual work.

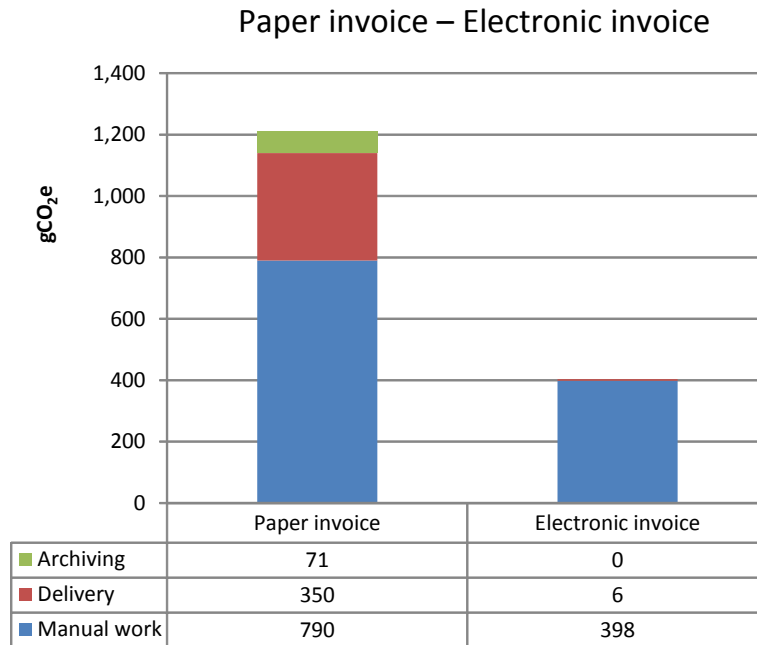
Table 7: Average carbon footprint of an incoming paper invoice / incoming electronic invoice, gCO₂eq

Incoming invoice	Manual work	Delivery	Archiving	Total
Paper invoice	344	44	35	423
Electronic invoice	94	3	0	97

Manual work forms most of the carbon footprint of both paper and electronic invoices. For electronic invoices, the emissions caused by other processing stages are considerably reduced in proportion to the emissions caused by manual work. While approximately 60% of the carbon footprint of a paper invoice is produced during manual work, the proportion of work-related emissions is as high as 99% for an electronic invoice. In paper invoicing, the remaining 40% of emissions are caused by the use of paper, envelopes, printing, franking and postal delivery. All of the aforementioned stages are automated in electronic invoicing, and the effect can be seen in the structure and size of the carbon footprint (Figure 6).



Figure 6: Different procedures and their proportions in the carbon footprint of invoices





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