



BY KATE RODGERS

E-Sign (UK) Ltd

The Financial and Environmental Impact of Digitising Paper Documents in Various Industries



Background Information

E-Sign is a Liverpool based company, which specialises in online documentation management and authentication. The company provides a service which allows other sectors and industries to digitalise all documents and store them safely on an online server. This service allows for a reduction in the use of paper and printing, as well as a reduction in time spent posting paper documents. E-Sign allows electronic signatures to be added to documents and returned to the sender almost instantly. As it is an online service, it provides access to documents from anywhere in the world, at any time.

The continued use of paper documents, in the majority of industries worldwide, has resulted in an increase in carbon emissions, as well as the sustained cost and time of printing (1). This increase in carbon emissions results largely from the production of paper, as opposed to the waste disposal (2).

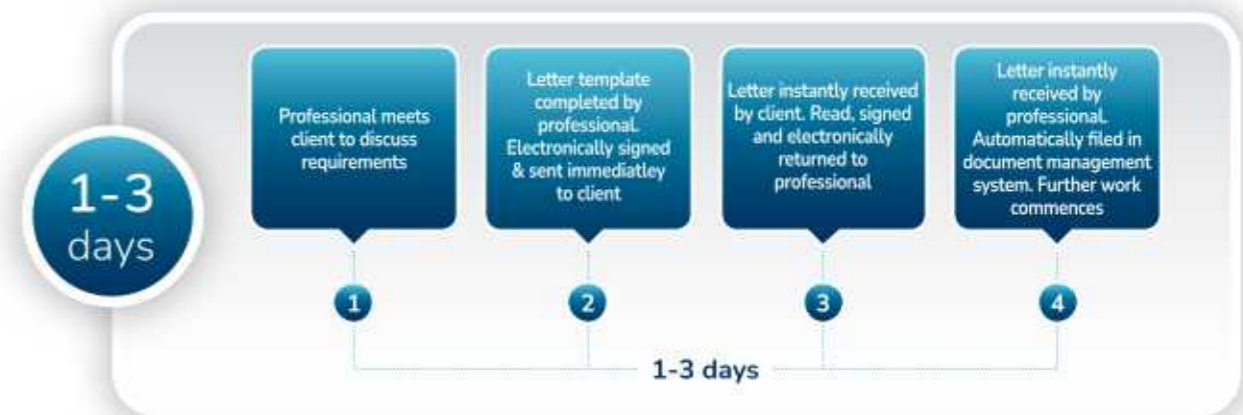
Three of the biggest paper dependant industries are: Legal, Recruitment/HR and eCommerce. In each of the three sectors listed, there is still a huge emphasis placed on printing each document and using traditional methods of postage to deliver those documents to clients. As well as the postage incurred, the storage of documents and transportation to the storage unit has all contributed to the cost of managing printed documents. Along with the financial costs incurred by companies in the above industries, the constant printing and posting of documents has also contributed to the carbon emissions generated in the U.K. and worldwide. A report by Neopost in May 2016 (3) found that the continued use of paper documents impacted business efficiency, productivity and profitability. This was due to the limited access of paper documents by employees, the unnecessary expense of using paper and impaired productivity. The report also found that the digitalisation of documents allowed employees to access documents from home, which in turn reduced CO2e emissions as well as improving productivity.

Furthermore, the paper-free process revolution handbook (2012) (4) showed that the Association of Information and Image Management found that if a business digitalises documents from the very start, it can result in a 30-50% increase in process productivity and a 3 to 10-fold reduction in turnaround time. This reduction in turnaround time can be explained by the process charts shown below.

Traditional Paper Document Process



Digital Document Process



Due to the costs and carbon emissions generated, this project will aim to determine the overall costs to businesses in the above three industries, as well as the carbon emissions generated. These costs, both financial and environmental, will be determined through establishing the amount of paper, printing, storage, postage and administration incurred.

These costs can then be shown to be reduced through the digitalisation of documents through E-Sign. The research carried out will predominantly be based on speaking with individuals within each of the three sectors, in order to gain first-hand experience and information. Due to the limited information available online for U.K. organisations, the literature included will be limited to the relevant information available. Costs of printing, postage and storage will be obtained through contacting companies involved, as well as utilising reports available online. The carbon emissions generated will be determined through the conversion factors available on government websites (5).

This project is part funded by the European Regional Development Fund which aims to support Eco-Innovation in Small-Medium Enterprises in North West England.

Caveats

The main aim of this project is to determine the extent of the paper usage in various industries. Due to the lack of information available online regarding businesses in the U.K. and time constraints, the majority of this report will be based on meetings with professionals in each of the areas outlined.

The meetings which took place with professionals in the areas will be the foundation for the report, as well as the calculations performed and therefore the project is limited in its generalisability. While the law firm was based in Liverpool, the other two sectors were based in other parts of the U.K. This meant that the "meetings" which took place with each sector were carried out over e-mail, except for that of the Law firm. In this way, the same amount of information was difficult to obtain for all three sectors and some of the sectors only provided minimal information, unlike the law firm. This creates limitations to the report as the same depth of information was not available for each sector which, in turn, may affect and cause inaccuracies in the calculations and conclusions made.

Furthermore, while completing the calculations in the project, it was assumed that any pieces of paper mentioned would, at some point, become waste and therefore contribute to carbon emissions. Some argue that paper is carbon neutral as it will decompose again however; the production of paper contributes far more greenhouses gases than the waste disposal of it.

Finally, the use of ISO 14067 (Carbon footprint of products – Requirements and guidelines for quantification and communication) as a standard of quantification is outside the expertise of the researcher and therefore was considered but not adhered to throughout the completion of this report.

Effects of Digitalising Paper Documents in the Legal Sector

Background

The legal sector is one of the most paper heavy industries in the world where files, e-mails and documents are constantly being printed off in order to be presented to clients, as well as stored for a considerable number of years. This heavy use of paper is significantly contributing to not only the financial running of a law firm, but also to the effect that law firm has on the environment. In order to accurately determine the effects of digitalising paper documents within the legal sector, the following aspects of the legal sector have been considered: Paper and printing costs and carbon emissions, storage costs, postage costs and carbon emissions, administration costs and turnaround time. The costs and effects of the above parameters have been calculated using both online literature and sources, as well as meeting with an employee of a Liverpool Law firm.

Key Information

This law firm has recently decided to digitalise their paper documents and therefore provided first hand, invaluable expertise for this report. Their main focus was to digitalise the sending of "matters" to new and current clients (including the terms of business (TOB) and the letter of engagement (LOE)) and therefore to use E-Sign for the engagement of clients. One of the main issues presented to law firms is waiting for the LOE to be sent back to the law firm, as well as the administrative time taken to type the letter, print it

off, get signed by a lawyer, send in the post and wait for it to be returned, before the case can progress. Through utilising E-Sign, this company has saved 1.4 million pieces of paper in the last 12 months. This is due to the LOE and TOB being sent electronically where the status of that file can be accessed immediately in order to determine what stage the case is at. This also includes the ability of the Law firm to send reminders to their clients to electronically sign the LOE where a notification will be sent to the law firm as soon as this action has been carried out. In this way, this Law firm has created one file including the up-to-date TOB which can be used by every lawyer at the firm and templates of the LOE have also been created in each department to cut down on the time spent completing each LOE before being sent to a client. The LOE and TOB combine to require, on average, 10 pieces of paper where this law firm had 18,000 new matters in a year.

Along with the printing and posting of files, the storage of physical files can be an added expense for most law firms. The retrieval of stored files, as well as destruction and administration costs, can result in a significant cost for law firms which could be avoided through the digitalisation of paper documents. This process allows for documents to be securely stored on an online server, allowing for easy access of documents, without the added expense.

Calculations

Using the Xerox printing system, the cost of printing was found to be:

Black and White printing (5p per page)	Colour printing (10p per page)
$1,400,000 \times 0.05 = \text{£}70,000$	$1,400,000 \times 0.10 = \text{£}140,000$

The cost of **buying the paper** itself was found to be:

Colour printing paper = Target Personal Paper 100g/m²

500 sheets per ream, FSC accredited paper
5 reams per box = 2,500 sheets
1 box = £26.94 on www.wlcoller.co.uk (only online source available)
$1,400,000/2500 = 560$ boxes
If those 560 boxes were used for colour printing, that would equate to £15,086.40 in costs.

Black and White paper = Advantage A4 laser copier paper

No price could be obtained for the paper listed above and therefore an average price was taken from a range of paper sources.

500 sheets per ream
Cost of one box=£14.99
If 560 boxes were used for B&W printing that would equate to £8,394.40

Carbon emissions related to the use of Colour paper

1000kg=1 tonne

1 box of paper=on average 14.5 kg

Primary production	Waste disposal
931.0 kg CO ₂ e per tonne of paper (Material use: Paper and Board: Mixed) (5)	21 kg CO ₂ e per tonne of paper (Waste Disposal: Paper and Board: Mixed) (5)
1.4 million pieces of paper = 560 boxes	1.4 million pieces of paper = 560 boxes
1000kg = 931 kg CO ₂ e	1000kg = 21 kg CO ₂ e
=> 8.120x931 kg CO ₂ e = 7,559.72 kg CO₂e for 1.4 million pieces of paper produced	8.12x21 kg CO ₂ e = 170.52 kg CO₂e for 1.4 million pieces of paper disposed of
931/1000 = 0.931x14.5 = 13.50 kg CO₂e per colour box of paper produced	21/1000 = 0.021x14.5 = 0.305 kg CO₂e per colour box of paper disposed of

Carbon emissions related to the use of B&W paper

1000kg=1 tonne

1 ream of paper=on average 13 kg

The carbon emissions emitted, due to the production and waste disposal of B&W paper, will be negligibly different to the calculations shown above for colour paper, and therefore have not been repeated.

Cost of printing one page

	Colour pages	B&W pages
Printing	10p per page	5p per page
Paper	£26.94 for 2500 sheets	£14.99 for 2500 sheets
	26.94 / 2500 = 0.012p per page	14.99 / 2500 = 0.0060p per page
Overall cost	0.012 + 0.10 = 0.11p per page	0.05 + 0.006 = 0.06p per page

Postage

This Liverpool law firm showed that the cost to **send one "matter"** (including LOE and TOB) = **£2.60** (£1.60 for the actual letter and £1 for a stamped addressed envelope).

The firm in question has 18,000 new matters a year

18,000 x £2.60 = £46,800 for postage alone (not including stationary costs or costs of having to resend letters which have yet to be signed).

Carbon emissions of sending letter by post:

The transportation of post was completed by Royal Mail where it was found that sending one letter via Royal Mail contributes 26g of CO₂ (6)

Convert from CO₂ to CO₂e:

26g CO₂ = 0.026 kg CO₂

0.026/0.40957 (conversion factor kg CO₂) =0.0635 kWh

0.0635*0.41205 (conversion factor kg CO₂e) =0.02616 kg CO₂e

18,000x0.02616kg CO₂e = **470.88 kg of CO₂e**

Storage

Each archive storage box holds 2000 sheets

1,400,000/2000 = 700 boxes would have been required, had this law firm not used E-Sign.

A paper in 2015 (7) found that the average **cost of storing one box for 7 years = £148.99**

The breakdown of the costs was as follows:

Storage for 7 years at 45p a month	£37.80
Initial box purchase	£1.45
Initial administration	£1.99
2 retrievals at £25 per trip leg	£100
Check in and out at £1.45 per event	£5.80
Destruction in year 7	£1.95
Whole life ownership total	£148.99
700 boxes @ £148.99 per box	£104,293

Administration

While the use of paper can have some obvious costs, such as printing and postage, other costs are present in the form of administrative costs. In this way, individuals in an administrative capacity are usually the ones who type up the LOE and post the letters out, while also checking the letter with a lawyer etc. The time spent completing these tasks could be removed through the digitalisation of documents where the whole process is much quicker and much more efficient.

According to www.payscale.com, the average salary for an individual in an **administrative capacity** is £17,000. By digitalising the documents sent out, the time originally spent typing and sending letters could be spent completing other tasks, as sending and checking documents digitally is a much more efficient process. In this way, if even half of that time could be redistributed to complete other tasks, that would result in a saving of £8,500 per year, per assistant.

Turnaround time

Finally, the time it takes for a "matter" to be sent via the traditional postage system, signed by the client and returned to the law firm in question, can take **2-3 weeks**, as shown by the process charts above. This excludes scenarios where the letter may have to be sent again, clients may forget to sign the letter or they may be delayed in returning the letter to the law firm. This turnaround time causes issues with proceeding with any work to be done on the case, as that cannot happen until the LOE has been returned to the law firm.

In this way, the digitalisation of documents allows documents to be sent immediately to the client, where the client can sign and return that letter instantly. In most cases, the turnaround time is **2-3 days**. This method of delivering letters to clients is, on average, **ten times quicker** than traditional postage means.

Overall cost savings by Liverpool law firm:

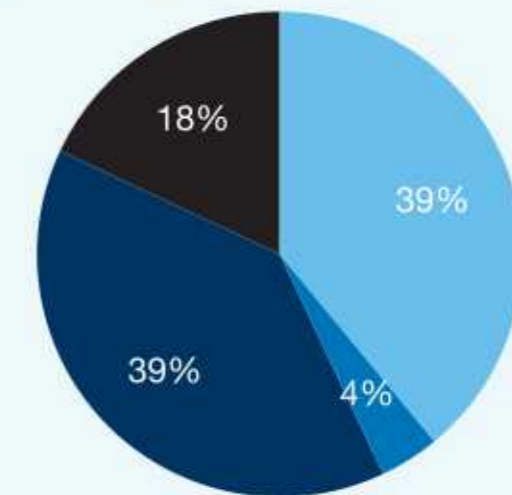
Printing	
Half colour pages	£70,000
Half B&W pages	£35,000
Paper	
Half colour	£7,543.20
Half B&W	£4,197.20
Postage	
Storage	£104,293
Administration	£17,000
Total financial saving	£284,833.40

Overall carbon emissions reduction by Liverpool law firm:

Factors	Kg CO ₂ e
Paper	
Waste disposal	170.52
Primary production	7,559.72
Postage	
	470.88
Total kg CO₂e reduced	8,201.12 kg CO₂e

Financial contribution of each aspect of paper based documentation

■ Printing ■ Paper ■ Storage ■ Postage



Conclusion

While the cost of digitalising documents has not been discussed, the cost and environmental savings which could be made by removing paper based documentation is plain to see. Interestingly, the cost of up keeping paper based documentation is made up primarily by the cost of storage and printing, as shown by the pie chart displayed above. The carbon emissions of using computers have not been discussed however; there is a substantial reduction in the carbon emissions by the law firm in Liverpool who chose to digitalise their documents. Their carbon emission reduction was found to be 8,201.12 kg CO₂e where the EPA (8) have created a service which allows calculations to be made to determine what is the equivalent to your carbon emissions. In this case, 8,201.12 kg CO₂e is equivalent to 1.7 passenger cars being driven for one year and 19,772 miles being driven by an average passenger vehicle.

Effects of Digitalising Paper Documents in the Recruitment / HR Sector

Background

Within the Recruitment/HR sector, paper is heavily relied upon in order to create T&C documents and contracts, for both clients and companies. The consistent reliance on paper contributes to the costs incurred by these Recruitment/HR consultancies, where the use of paper is not always the most efficient method of communication or method of finalising contracts. The environment is further affected by the CO₂e generated from the printing and posting of documents. Two recruitment/HR companies were contacted for this report, where the results of both are printed below. The same questions were sent to both parties where the main comparisons can occur between the number of employees in each company, and therefore company size. Similar to the Law firm discussed above, the areas of interest were paper and printing use, storage, administration costs, postage and turnaround time where both the financial and environmental aspects were considered.

Key Information

Both recruitment consultancies are clients of E-Sign and have therefore digitalised certain aspects of their company in order to create more efficient processes.

The first company is a Welsh based consultancy (40 employees) where they focussed on digitalising their T&C documents so that these did not need to be sent in the post by the client. Before working with E-Sign, this company would e-mail their contracts and T&C documents to their clients where the client could either sign the contract and return via e-mail or post. In this way, the use of E-Sign allowed the Welsh consultancy to digitalise the T&C documents and remove that expense for the client while also having an ease-of-access document available online, at any time. Through this process, the Welsh consultancy stated that they have reduced their printing by 5% where initially they would have printed between 40,000 and 45,000 pages a year. This company is also in the process of trialling the digitalisation of contracts with E-Sign, where the company processes 150-200 contracts annually. This would allow clients to electronically receive their contracts and T&C documents, sign and instantly return to the company, increasing the turnaround time of the documents, improving the customer service experience for the client and reducing the harmful effects on the environment.

The second company analysed is based in the South East of the U.K. where they have 58 employees. This company utilises E-Sign to send their contracts out to their clients where the overall process can be completed as efficiently as possible. Here, 1500 contracts are sent out annually where each contract is, on average, 11 pages. Previous to E-Sign, this company sent everything via e-mail where the expense then lay with the client as they would have to print and return the contract via post, much like the Welsh company outlined above. Interestingly, this company still prints out any signed contracts they receive

electronically. The purpose of this is to have ease-of-access to the files when auditing. However, the law firm above have arranged that any signed documents which are electronically returned, are to be electronically placed in a document management system (DMS), which allows for the reduction in printing. In this way, the costs, and possible reductions, of printing have still been calculated in order to show the possible reductions available to this company, both financial and environmental.

Neither of the two companies pay to store their files at a separate location. All files are stored on site which reduces their expenses, however, in order to file such documents on site, space must be 10 available. This space may not be an obvious financial cost, however; it reduces the space available for the employees to work from and also the building in which the company operates from must have had sufficient space available in order to allow for the storage of files on site.

Calculations (Welsh based Recruitment Consultancy)

Paper and Printing

Using the Xerox printing system, **the cost of printing** was found to be:

Black and White printing (5p per page)	Colour printing (10p per page)
$2,000-2,250 \times 0.05 = \text{£}100-\text{£}112.50$	$2,000 - 2,250 \times 0.10 = \text{£}200-\text{£}225$

Buying the paper:

The recruitment/HR consultancy, who provided the data for this report, stated that they used the same office paper for both their black and white and colour printing.

Colour and B&W printing paper = Standard Office paper 60-80g/m²

500 sheets per ream, FSC accredited paper
5 reams per box = 2,500 sheets
1 box = £14.99
$2,000-2,250/2500=0.8-0.9$ boxes
From the workings above, this would equate to £11.99-£13.50 on paper per annum.

Carbon emissions related to the production and disposal of paper

1000kg=1 tonne

1 box of paper=on average 13 kg

Primary production	Waste disposal
931.0 kg CO ₂ e per tonne of paper (Material use: Paper and Board: Mixed) (5)	21 kg CO ₂ e per tonne of paper (Waste Disposal: Paper and Board: Mixed) (5)
2,000-2,250 pages = 0.8-0.9 boxes	2,000-2,250 pages = 0.8-0.9 boxes
0.8-0.9 boxes = 10.4-11.7 kg	0.8-0.9 boxes = 10.4-11.7 kg
1000kg = 931 kg CO ₂ e	1000kg = 21 kg CO ₂ e
931/1000 = 0.931 × 10.4-11.7 = 9.68-10.89 kg CO₂e for 2,000-2,250 pages of paper produced	21/1000 = 0.021 × 10.4 - 11.7 = 0.220-0.246 kg CO₂e for 2,000-2,250 pages of paper disposed of

Cost of printing one page

	B&W pages	Colour pages
Printing	5p per page	10p per page
Paper	£14.99 for 2500 sheets	£14.99 for 2500 sheets
	14.99/2500 = 0.006p per page	14.99/2500 = 0.006p per page
Overall cost	0.05 + 0.006 = 0.06p per page	0.006 + 0.10 = 0.11p per page

Postage

Prior to working with E-Sign, this Welsh consultancy would send the majority of their contracts out via e-mail to be signed. While this approach is effective, many clients would return the contract and terms and conditions via the post. This method results in the client having to spend more money than is necessary. As the average contract is made up of 8 pages, not including T&C, this would equate to similar weight of the "matters" sent out by the Liverpool law firm. As this recruitment consultancy sends out, on average, 150-200 contracts a year, clients may be charged the £1.60 to return the post to the recruitment company.

150-200 new contracts a year

150 - 200 × £1.60 = £240-£320 for postage alone
(not including stationary costs).

A reduction in these costs, if even to the client, would result in a much **better experience for the client** and **improve the customer service** aspect of the company.

Carbon emissions of sending letter by post:

The transportation of post was completed by Royal Mail where it was found that sending one letter via Royal Mail contributes 26g of CO₂ (6)

Convert from CO₂ to CO₂e:

26g CO₂ = 0.026 kg CO₂

0.026/0.40957 (conversion factor kg CO₂) = 0.0635 kWh

0.0635*0.41205 (conversion factor kg CO₂e) = 0.02616 kg CO₂e

150-200 contracts sent out a year.

150 - 200 × 0.02616kg CO₂e = 3.924-5.232 kg of CO₂e

Storage

The recruitment/HR company **store all their paper files on site**. While this method does eliminate the cost of storage to the company, the storage of files on site requires the **access to substantial amounts of space**. Even though the space used is not rented from another company, the access to this space still **costs the company money**. This space could be used for other employees to work from, or could also be leased to another company interested in using the space.

Administration

While the use of paper can have some obvious costs, such as printing and postage, other costs are present in the form of administrative costs. If T&C documents are returned to this recruitment company by post, they must be scanned back into the computer. Even if the T&C document is returned by e-mail, a PDF editing software must be used to convert the document from JPG to PDF.

This administration work is required to be completed for every T&C document which takes time and requires an individual to ensure this is done.

According to www.payscale.com, the average salary for an individual in an **administrative capacity is £17,000**. By digitalising the T&C documents (and possibly contracts) sent out, the time originally spent e-mailing, scanning and converting documents could be used to complete many other tasks. In this way, if even half of that time could be redistributed to complete other tasks, that would result in a saving of £8,500 per year, per assistant.

Turnaround time

While the T&C documents are initially sent by e-mail, the return post of the documents can lengthen the turnaround time of the documents. The scanning of the document, as well as the possible conversion of the document to PDF format, also contributes to the overall turnaround time. This turnaround time is usually **5-6 days**.

In this way, the digitalisation of documents allows documents to be sent immediately to the client, where the client can sign and return that document instantly. In most cases, the turnaround time is **2-3 days**. This method of delivering documents to clients is, on average, **twice as fast** as the current turnaround time.

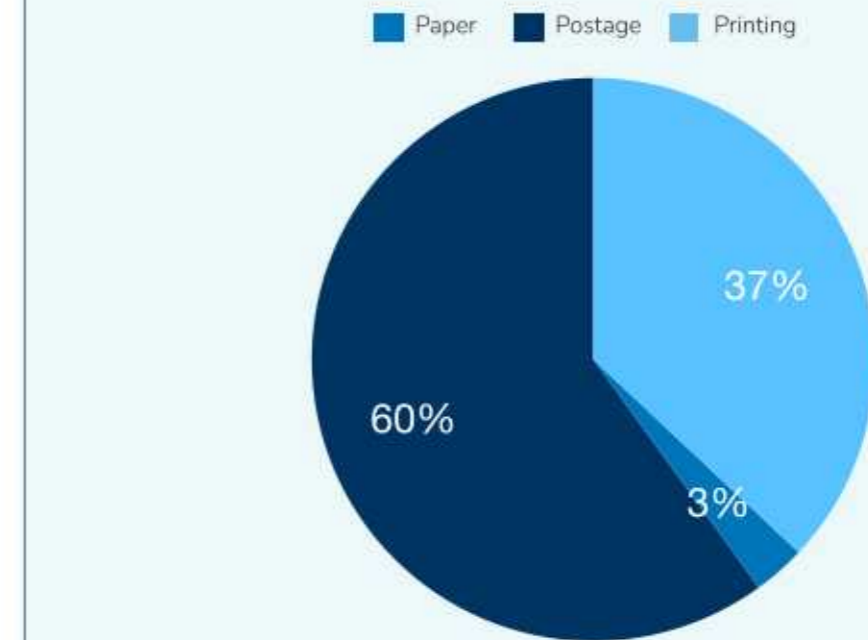
Overall cost savings by Welsh Recruitment/HR consultancy:

Printing	
Half B&W	£53
Half colour	£106
Paper	
0.8-0.9 of one box of paper	£12,75
Postage	£280
Storage	N/A
Administration	£17,000
Financial saving	£17,451.75
Cost of contracts	X2
Total financial saving	£34,903.50

Overall carbon emissions reduction by Welsh Recruitment/HR consultancy:

Factors	Kg CO ₂ e
Paper	
Waste disposal	0.233
Primary production	10.20
Postage	4.624
Environmental saving	15.0527
Cost of contracts	X2
Total kg CO₂e reduced	30.114 kg CO₂e

The breakdown of costs for a recruitment / hr consultancy using paper documents



Conclusion

While the overall financial and environmental reductions are not as substantial as they were for the law firm discussed above, significant savings have been made. This recruitment consultancy has saved over 2,000 sheets of paper a year which may not appear to be a significant amount, however; it is equivalent to two employees annual printing. This figure has resulted from the digitalisation of T&C documents only. The digitalisation of contracts would allow this figure to double, which would reduce the printing by over 10%. In a small company of 40 employees, a 10% saving is a significant reduction, both financially and environmentally speaking. The main cost to this company was administration. While employing an administration assistant is necessary for most companies, the work they do can be better managed through the digitalisation of documents. The full digitalisation of documents allows for the documents to be filed automatically in a DMS, where the administrative input is minimal, compared with the typing, scanning, editing and filing of documents previously completed. Interestingly, the largest expense is postage, as shown above in the chart. However, this expense is to the client as opposed to the company who currently e-mail contracts to their clients. A removal of such an expense would allow for a removal of costs to the client, leading to an improvement in the customer service experience and finally, a more efficient process of sending, signing and filing documents and contracts.

Effects of Digitalising Paper Documents in the Recruitment/HR Sector II

Paper and Printing

Using the Xerox printing system, the **cost of printing** was found to be:

Black and White printing (5p per page)	Colour printing (10p per page)
$16,500 \times 0.05 = \text{£}825$	$16,500 \times 0.10 = \text{£}1,650$

The cost of **buying the paper** itself was found to be:

Colour and B&W printing paper = Standard Office paper 60-80g/m²

500 sheets per ream, FSC accredited paper
5 reams per box = 2,500 sheets
1 box = £14.99
$16,500/2,500=6.6$ boxes
From the workings above, this would equate to £98.93 on paper per annum

Carbon emissions related to the production and disposal of paper

1000kg=1 tonne

1 box of paper=on average 13 kg

Primary production	Waste disposal
931.0 kg CO ₂ e per tonne of paper (Material use: Paper and Board: Mixed) (5)	21 kg CO ₂ e per tonne of paper (Waste Disposal: Paper and Board: Mixed) (5)
16,500 pages = 6.6 boxes	16,500 pages = 6.6 boxes
$6.6 \times 13\text{kg} = 85.8 \text{ kg}$	$6.6 \times 13\text{kg} = 85.8 \text{ kg}$
$931/1000 = 0.931 \times 85.8 = \text{79.88 kg CO}_2\text{e for 6.6 boxes of paper produced.}$	$21/1000 = 0.021 \times 85.8 = \text{1.80 kg CO}_2\text{e for 6.6 boxes of paper disposed of.}$

Cost of printing one page

	Colour pages	B&W pages
Printing	10p per page	5p per page
Paper	£14.99 for 2500 sheets	£14.99 for 2500 sheets
	$14.99/2500 = 0.006\text{p per page}$	$14.99/2500 = 0.006\text{p per page}$
Overall cost	$0.006 + 0.10 = 0.11\text{p per page}$	$0.05 + 0.006 = 0.06\text{p per page}$

Postage

Prior to working with E-Sign, this recruitment consultancy would send the majority of their contracts out via e-mail to be signed. While this approach is effective, clients would have to return the contract and terms and conditions via the post. This method results in the client having to spend more money than is necessary. As the average contract is made up of 11 pages this would equate to similar weight of the "matters" sent out by the Liverpool law firm. As this recruitment consultancy sends out, on average, 1,500 contracts a year, clients were charged the £1.60 to return the post to the recruitment company.

1,500 new contracts a year

$$1,500 \times \text{£}1.60 = \text{£}2,400 \text{ for postage alone}$$

A reduction in these costs, if even to the client, results in a much better experience for the client and improves the customer service aspect of the company.

Carbon emissions of sending letter by post:

The transportation of post was completed by Royal Mail where it was found that sending one letter via Royal Mail contributes 26g of CO₂ (6)

Convert from CO₂ to CO₂e:

$$26\text{g CO}_2 = 0.026 \text{ kg CO}_2$$

$$0.026/0.40957 \text{ (conversion factor kg CO}_2\text{)} = 0.0635 \text{ kWh}$$

$$0.0635 \times 0.41205 \text{ (conversion factor kg CO}_2\text{e)} = 0.02616 \text{ kg CO}_2\text{e}$$

$$1,500 \times 0.02616\text{kg CO}_2\text{e} = \text{39.24 kg of CO}_2\text{e}$$

Storage

The recruitment/HR company **store all their paper files** on site. While this method does eliminate the cost of storage to the company, the storage of files on site requires the **access to substantial amounts of space**. Even though the space used is not rented from another company, the access to this space still costs the company money. This space could be used for other employees to work from, or could also be leased to another company interested in using the space.

Administration

While the use of paper can have some obvious costs, such as printing and postage, other costs are present in the form of administrative costs. When contracts used to be returned to this recruitment company by post, they must then be checked and filed on site for purposes of auditing. Currently, this recruitment consultancy continues to print their contracts, even when the contract is returned and signed electronically. This task requires individuals to monitor the contracts which have been signed, ensure they are printed and in turn, filed. The use of a DMS would allow the contracts to be automatically filed on an online server, reducing the costs and time of printing and filing the contract, while also allowing that individual to continue with other tasks.

According to www.payscale.com, the average salary for an individual in an **administrative capacity** is **£17,000**. By digitalising and storing the contracts sent out, the time originally spent e-mailing, monitoring and printing the contracts could be used to complete many other tasks. In this way, if even half of that time could be redistributed to complete other tasks, that would result in a saving of £8,500 per year, per assistant.

Turnaround time

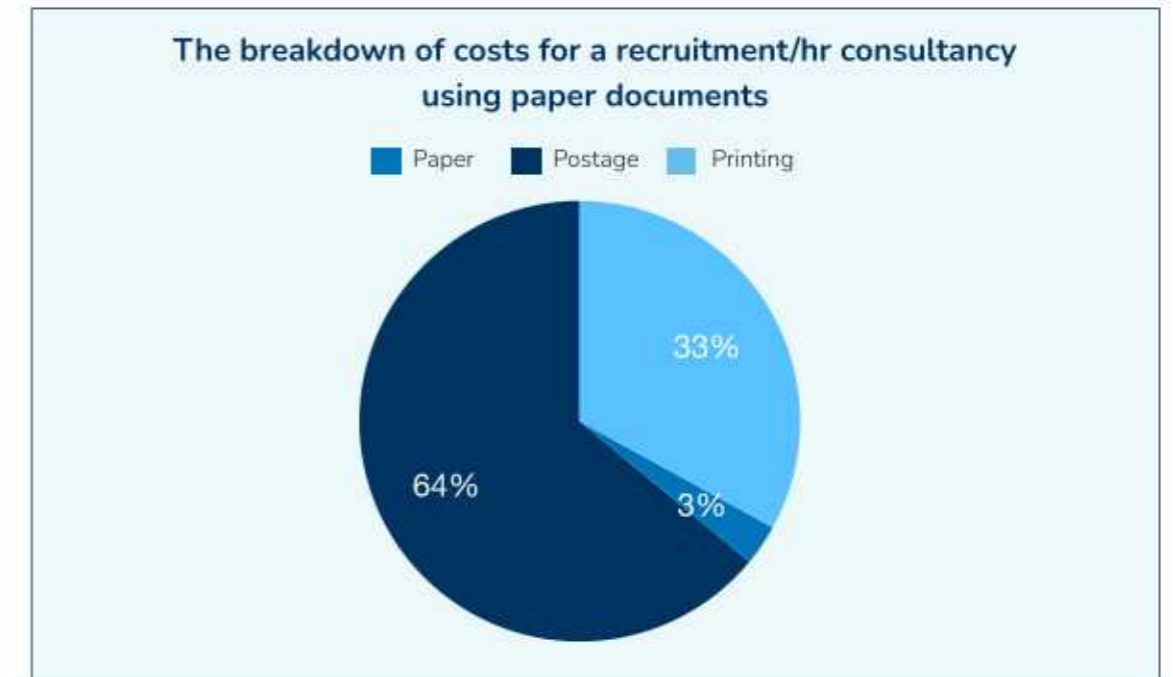
Finally, the time it takes for a contract to be sent by e-mail, printed, signed by the client and returned to the recruitment consultancy in question, can take up to **10 days**. This turnaround time causes issues with efficiently finalising employment for an individual and the company in question. In this way, the digitalisation of documents allows documents to be sent immediately to the client, where the client can sign and return that letter instantly. In most cases, the turnaround time can be hours or at most, **2-3 days**. This method of delivering letters to clients is, on average, **five times quicker** than traditional postage means.

Overall cost savings by Recruitment Consultancy (Company and client):

Printing	
Half colour pages	£825
Half B&W pages	£412.50
Paper	
B&W or colour	£98.93
Postage	£2,400
Administration	£17,000
Total financial saving	£20,736.43

Overall carbon emissions reduction by Recruitment Consultancy (Client and company):

Paper	Kg CO₂e
Waste disposal	1.80
Primary production	79.88
Postage	39.24
Total kg CO₂e reduced	120.92 kg CO₂e



Conclusion

Similar to the conclusion of the first recruitment firm, the reductions made through the digitalisation of contracts have not been as substantial as that in the law firm. However, the reductions made in this recruitment consultancy are noteworthy for various reasons. This is a larger firm where there is a higher number of employees and therefore a larger amount of paper used. The digitalisation of contracts in this firm has allowed for the reduction of postage costs to the clients, which was the largest expense calculated above. While the EPA calculator (8) did not have results as significant as those from the Liverpool law firm, they still showed what the equivalent environmental effect was.

The 120.92 kg CO₂e reduction in carbon emissions was found to be the equivalent as 1,063 miles driven by an average car or 473 lbs of coal burned, which is still a significant reduction.

With this company, a large emphasis has been placed on printing the electronically signed contracts in order to store them for auditing. This decision has led to printing being the second highest expense for the firm, which could be reduced or even removed, with the efficient use of a DMS. In this way, the full benefits of digitalising documents has not yet been fully taken advantage of, which would lead to significant reductions in both the environmental and financial aspects of recruitment/HR.

Effects of Digitalising Paper Documents in the eCommerce Sector

Background

Since the introduction of the internet, the eCommerce sector has grown massively allowing individuals to transfer information across the globe; instantly. Within this sector, the use of paper is heavily relied upon, ranging from contracts for staff members, as well as contracts for businesses and project agreements. Due to the rate at which this sector has expanded in recent years, the effect of their paper use, both financially and on the environment, is one of growing importance. While these costs may affect the business itself, previous findings above have highlighted the cost to the customer also. In this way, the digitalisation of documents may reduce the financial and environmental costs to the sectors in question, but can also provide a much more efficient service to the customer.

Key Information

The eCommerce company used in this study is a current client of E-Sign and was chosen in order to understand the type of documents E-Sign handled, as well as the changes they have experienced since the introduction of E-Sign.

This eCommerce company is based in North East of England and has 250 employees. This company has been working with E-Sign for a considerable amount of time and currently use E-Sign for staff contracts and project agreements. The most common document type is that used for project agreements where the documents can range from 2-4 pages per agreement. This study took part in early December where, at that point, E-Sign had handled over 1700 documents for this eCommerce business since the beginning of 2016. Similar to the recruitment consultancies outlined above, this company would e-mail their clients a PDF file. This file would then need to be printed, signed and returned to the company by the client, increasing the cost and hassle to the client. This company found that by using E-Sign, one of the most noticeable changes was the turnaround time. Where previously it could take up to ten days to receive a document, the average turnaround time for project agreements in 2016 was just two days, where there were numerous cases of agreements being signed within one minute, by using E-Sign. This report also discusses the paper use, printing costs, postage costs and environmental costs which this company would have incurred previous to introducing E-Sign.

Similar to the recruitment companies discussed above, this eCommerce company does not pay for storage of files off site. All files are stored on site which reduces their expenses, however, in order to file such documents on site, space must be available. This space may not be an obvious financial cost, however, it reduces the space available for the employees to work from and also the building in which the company operates from must have had sufficient space available in order to allow for the storage of files on site.

Calculations

Paper and Printing

Using the Xerox printing system, the cost of printing was found to be:

Black and White printing (5p per page)	Colour printing (10p per page)
$3,400-6,800 \times 0.05 = \text{£}170-340$	$3,400-6,800 \times 0.10 = \text{£}340-680$

Range of paper used=3,400-6,800

=>5,100=average

The cost of buying the paper itself was found to be:

Colour and B&W printing paper = Standard Office paper 60-80g/m²

500 sheets per ream, FSC accredited paper
5 reams per box = 2,500 sheets
1 box = £14.99
$5,100/2,500 = 2.04$ boxes
From the workings above, this would equate to £30.57 on paper per annum

Carbon emissions related to the production and disposal of paper

1000kg=1 tonne

1 box of paper=on average 13 kg

Primary production	Waste disposal
931.0 kg CO ₂ e per tonne of paper (Material use: Paper and Board; Mixed) (5)	21 kg CO ₂ e per tonne of paper (Waste Disposal: Paper and Board; Mixed) (5)
5,100 pages = 2.04 boxes	5,100 pages = 2.04 boxes
$2.04 \times 13 \text{ kg} = 26.52 \text{ kg}$	$2.04 \times 13 \text{ kg} = 26.52 \text{ kg}$
$931/1000 = 0.931 \times 26.52 = \text{24.69 kg CO}_2\text{e for 2.04 boxes of paper produced.}$	$21/1000 = 0.021 \times 26.52 = \text{0.56 kg CO}_2\text{e for 2.04 boxes of paper disposed of.}$
$931/1000 = 0.931 \times 13 = \text{12.10 kg CO}_2\text{e per box of paper produced.}$	$21/1000 = 0.021 \times 13 = \text{0.273 kg CO}_2\text{e for one box of paper disposed of.}$

Cost of printing one page

	Colour pages	B&W pages
Printing	10p per page	5p per page
Paper	£14.99 for 2500 sheets	£14.99 for 2500 sheets
	14.99/2500 = 0.006p per page	14.99/2500 = 0.006p per page
Overall cost	0.006 + 0.10 = 0.11p per page	0.05 + 0.006 = 0.06p per page

Postage

This eCommerce company used to send all documents as a PDF file, via e-mail, to their clients. The clients would then need to print, sign and return the document to the company. While the documents could be returned by fax, a large proportion of individuals may not have access to a fax machine and may therefore return the document via the post. So while this method is efficient for the company, and keeps their costs down, this method can cause unnecessary problems and expenses for the clients.

1,700 new contracts a year

$$1,700 \times £1.60 = £2,720 \text{ for postage alone}$$

A reduction in these costs, if even to the client, results in a much better experience for the client and improves the customer service aspect of the company.

Carbon emissions of sending letter by post:

The transportation of post was completed by Royal Mail where it was found that sending one letter via Royal Mail contributes 26g of CO₂ (6)

Convert from CO₂ to CO₂e:

$$26\text{g CO}_2 = 0.026 \text{ kg CO}_2$$

$$0.026/0.40957 \text{ (conversion factor kg CO}_2) = 0.0635 \text{ kWh}$$

$$0.0635 \times 0.41205 \text{ (conversion factor kg CO}_2\text{e)} = 0.02616 \text{ kg CO}_2\text{e}$$

$$1,700 \times 0.02616 \text{ kg CO}_2\text{e} = 44.47 \text{ kg of CO}_2\text{e}$$

Storage

The recruitment/HR company **store all their paper files on site**. While this method does eliminate the cost of storage to the company, the storage of files on site requires the **access to substantial** amounts of space. Even though the space used is not rented from another company, the access to this space still costs the company money. This space could be used for other employees to work from, or could also be leased to another company interested in using the space.

Administration

While the use of paper can have some obvious costs, such as printing and postage, other costs are present in the form of administration. While some of the documents were returned to this company by fax, and some by post, they must then be checked and filed on site for purposes of auditing. This task requires individuals to monitor the agreements which have been signed, are correctly filed as well as an employee drawing up each individual agreement and document for each agreement. The use of a DMS would allow the agreements and contracts to be automatically filed on an online server, reducing the costs and time of printing and filing the contract, while also allowing that individual to continue with other tasks.

According to www.payscale.com, the average salary for an individual in an **administrative capacity** is **£17,000**. By digitalising and storing the documents sent out, the time originally spent e-mailing, monitoring and filing the contracts could be used to complete many other tasks. In this way, if even half of that time could be redistributed to complete other tasks, that would result in a **saving of £8,500 per year**, per assistant.

Turnaround time

Finally, the time it takes for a contract to be sent by e-mail, printed, signed by the client and returned to the eCommerce company can take up to **10 days**. This turnaround time causes issues with efficiently finalising employment for an individual and projects.

In this way, the digitalisation of documents allows documents to be sent immediately to the client, where the client can sign and return that document instantly. An employee at this eCommerce company stated that, on average, it takes just two days to receive back a document using E-Sign.

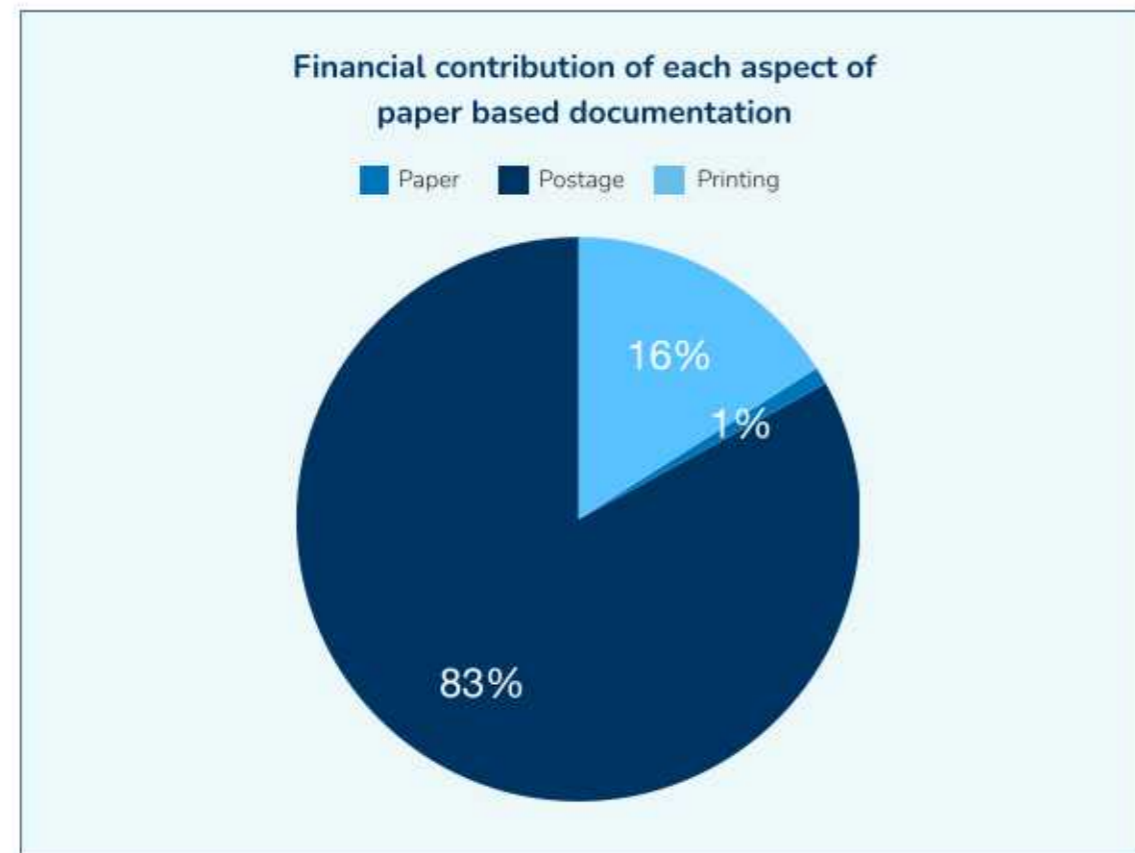
They also stated that there are numerous cases whereby documents were sent, signed and **returned in under one minute**. This method of delivering documents to clients is, on average, **five times quicker** than traditional postage means.

Overall cost savings by eCommerce Company (Company and client):

Printing	
Half colour pages	£340
Half B&W pages	£170
Paper	
B&W or colour	£30.57
Postage	£2,720
Administration	£17,000
Total financial saving	£20,260.57

Overall carbon emissions reduction by eCommerce Company (Client and company):

Factors	Kg CO ₂ e
Paper	
Waste disposal	0.56
Primary production	24.69
Postage	
	44.47
Total kg CO₂e reduced	69.72 kg CO₂e



Conclusion

As shown with both HR/Recruitment consultancies above, the biggest expense this eCommerce company encountered was the cost of postage. While this expense does not directly affect the business, they are associated with the cost as their clients are forced to return the documents to the business, once signed. While this may not be a noticeable cost to each client, the overall cost has found to be substantially high. As well as the cost of postage, the carbon emissions associated with every letter being sent also accumulates to a significant amount when all 1700 documents are taken into account. Both of these costs have since been eliminated since the introduction of E-Sign where every document can be easily and

efficiently returned to the business through one click of a button. The reduction in emissions of 69.72 kg CO₂e is the equivalent of consuming 28.8 gallons of gasoline or 613 miles driven by an average car (8). So while the overall results may not be as substantial as the law firm in Liverpool, they still have shown significant savings.

As shown above in the HR/Recruitment consultancies and especially in the Liverpool Law firm, the most efficient way of utilising E-Sign is through managing as many documents as possible online. The more documents E-Sign have handled for companies has resulted in much higher savings for the company financially, as well as the environmental impact.

Recommendations / Future work

In conclusion, the anticipated financial and environmental reductions are clear from the calculations performed above. Future work in the area should focus on developing an excel sheet which would allow any firm, in any industry, to input their paper usage. This, in turn, would instantly calculate that firms overall financial cost and environmental contribution. This would allow for an efficient and effective means of displaying how much, both financially and environmentally, paper is costing their company. This may allow for a reduction in costs and carbon emissions but also an improvement in employee productivity and business efficiency (3). This improvement was also discussed and supported by the paper-free process revolution handbook (2012) (4) where the benefits of digitalising a business from the very start resulted in a 30-50% in productivity. Furthermore, due to the limitations of this report, as set out in the caveat above, there may be a beneficial aspect to completing a similar project but adhering to the ISO 14067 standards. Finally, a reduction in paper use would be of huge benefit to the environment as the production of paper contributes far more CO₂e than the waste disposal. In this way, the demand for paper would be reduced which would have a much more beneficial contribution to the environment.

Acknowledgements

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Contact us

Sales: 0330 912 7956

esigndigital.com

info@esigndigital.com

Liverpool Office

8 Princes Parade,
Liverpool,
L3 1DL
England, UK

Isle of Man

50 Athol Street,
Douglas,
Isle of Man, IM1 1JB
England, UK

EU

Five Lamps Place,
77-80 Amiens St,
Dublin
Ireland

US

Suite 8500
One World Trade Center
New York, 10007
United States