JEITA

Report on the Framework for Quantifying IT Solutions' Contributions to CO2 Emissions Suppression

-- Umbrella Method for Calculation and Aggregation --

Mar. 2017

Special Committee for Energy-Saving Contributions by IT

Green IT Committee

Japan Electronics and Information Technology Industries Association

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Preface

In 2015, Japan submitted to the United Nations its goal of reducing greenhouse gas emissions by 26% from 2013 levels by 2030. To achieve this goal, ambitious targets that aim to reduce emissions by roughly 30-40% have been defined in sectors such as households, business, and logistics. We are expected to develop and popularize innovative technologies that enable emissions suppression, and contribute to the suppression of greenhouse gas emissions on a global level.

In response to these efforts to achieve low carbon emissions, the electrical and electronic industries, including IT and electronics, are making far-reaching contributions not only with respect to improving energy-saving efficiencies in production and the same for IT/electronic devices that are widely used in society, but also in terms of suppressing emissions in other sectors by improving energy usage efficiencies in society at large through the utilization of IT solutions.

The utilization of IT solutions have great potential for making major contributions towards eliminating waste and irregularities, as well as suppress CO2 emissions. The methods for calculating these effects were published by the Green IT Promotion Council in February 2013 in the form of an Explanatory Booklet titled "Energy-Saving Contributions for Society at Large from IT Solutions." This booklet has been used by a large number of businesses to date.

We believe that efforts to ascertain and call attention to the effects of IT solutions are useful in fostering an understanding of the energy-saving efforts that are being carried out by businesses and industries.

That being said, the total amount of energy-saving contributions made by IT solutions on the market cannot be ascertained using simple methods of calculation, such as by multiplying the amounts of contribution of individual IT units with the number of units sold. These calculations require know-how, such as for calculating the contributions made by solutions whose configurations vary from user to user and then aggregating the total from these results, and also involve labor and time-intensive tasks such as for gathering a diverse range of data.

In this report, we present a method for making simplified calculations of the effects of IT solutions that are appropriate for different levels of precision required for disclosure and have taken considerations to encourage its widespread use.

Specifically, this is a method of calculating the total amount of contributions by defining representative configurations for different IT solutions based on examples provided by committee member companies, calculating their effects, and defining basic units that correspond to the number of units sold. In this Report on the Framework for Quantifying IT Solutions' Contributions to CO2 Emissions Suppression (Umbrella Method for Calculation and Aggregation) we outline the ideas and steps that underlie the process from calculating the effects of IT solutions to aggregating them.

It would be our greatest joy if companies who supply IT solutions make use of this report and, in doing so, are able to draw attention to the effect they have on CO2 emissions suppression.

March 2017

Hitoshi Maekawa, Chairperson

Special Committee on IT's Energy-Saving Contributions

Introduction

1. Background

1.1 IT solutions' contributions with respect to CO2 emissions suppression

We believe that energy-saving efforts being made in the IT area have great potential for advancing efforts to promote the suppression of CO2 emissions and conservation of energy.
One of the IT industry's potential areas of contribution in countering global warming is the reduction of CO2 emissions in their production activities. While these efforts are being made in a diverse range of industrial areas, the amount of emissions produced by the IT industry is limited, accounting for roughly only 1% of total emissions in Japan in 2014. Meanwhile, efforts to reduce the power consumption of all IT and electronic devices that are widely used in our society, and improve the efficiency of energy use in society at large through the use of IT solutions will have a massive ripple effect. These two areas -- "energy conservation of IT devices themselves (Green of IT)" and "energy conservation in our societies enabled by the use of IT (Green by IT)" -- constitute the two pillars of Green IT. In other words, there are widespread expectations for IT's contribution with respect to reducing CO2 emissions in other sectors where roughly 99% of energy consumption occurs.

1.2 Past activities of the Special Committee on IT's Energy-Saving Contributions

The Green IT Promotion Council (GIPC) and its succeeding agency, the Green IT Committee of the Japan Electronics and Information Technology Industries Association (JEITA), have been engaged in efforts to quantify the effects of Green by IT. As a result of our activities, we have published the following reports on Green by IT.

(1) Investigative Analysis Committee Report FY2008 (Japanese), Issued Jun. 2009

(2) Effects of Green IT in 2020 (Japanese), Published May 2010

(3) Investigative Analysis Committee Report FY2009 (Japanese), Issued Jun. 2010

(4) FY2009 Green IT Promotion Council (GIPC) Summary for the Survey and Estimation Committee of the GIPC Report - Contribution of Green IT to the Realization of a Low Carbon Society –(English), Published Jun. 2010

(5) Investigative Analysis Committee Report FY2010 (Japanese), Issued Jun. 2011

(6) Investigative Analysis Committee General Report (FY2008 thru 2012) (Japanese), Issued Feb. 2013
URL:http://home.jeita.or.jp/greenit-pc/activity/reporting/110628/pdf/survey01.pdf

(7) Energy-Saving Contributions for Society at Large from IT Solutions -- Perspective on Evaluations of Contributions from "Green by IT" -- [Explanatory Booklet], (Japanese and English), Issued Feb. 2013
URL:http://home.jeita.or.jp/greenit-pc/activity/reporting/110628/pdf/survey02.pdf
URL:http://home.jeita.or.jp/greenit-pc/activity/reporting/110628/pdf/survey03.pdf

Furthermore, the Environmental Committee at JEITA has published the results of its reviews of the potential emissions suppression that may be earned by "Green by IT" in 2030 in the following reports.

(8) "IT Solutions' Contributions to Global Warming Countermeasures," Issued Nov. 2016

(9) "Report of Reviews of IT Solutions' Contributions to Global Warming Countermeasures -- Potential for reducing greenhouse gas emissions as we move forward to 2030 --" Environmental Promotion Committee Global Warming Countermeasure Communication Investigation TF, Published Nov. 2016

The effects that IT solutions have on CO2 emissions suppression are believed to extend to a broad range of areas in our societies. Given this view, we have gathered information on representative examples of CO2 emissions suppression enabled by IT solutions, summarized the lines of thinking behind methods for making objective and quantitative evaluations, gathered data required for making these quantitative evaluations so that they may be used by a broad range of companies and industries, and compiled this information in document (7) listed above, the "Energy-Saving Contributions for Society at Large from IT Solutions -- Perspective on Evaluations of Contributions from "Green by IT" -- [Explanatory Booklet]" (hereafter referred to as the "GIPC Explanatory Booklet").

1.3 Situations where evaluations for CO2 emissions suppression are used

The quantification of Green by IT is required in many situations.
One example would be where a vendor of IT solutions (hereafter referred to as "IT solution vendor") seeks to present calculations of the effects that their IT solutions have on CO2 emissions suppression to customers who implement them. Since CO2 emissions are affected by a variety of factors including system configuration and usage, data regarding these factors must be gathered and the difference in CO2 emissions before and after implementation must be compared in order to make these calculations. Another example would be where the IT solution vendor, having sold a specific IT solution, seeks to make calculations of the total annual suppression of CO2 emissions for this particular solution. In such cases, it would not be easy to gather data regarding system configuration and usage for all shipped solutions to calculate their amount of CO2 emissions suppression. To address this issue, it would be useful to prepare representative implementation scenarios for different types of IT solutions, and estimate amounts of CO2 emissions being suppressed by multiplying these with parameters such as the number of solutions shipped. In other instances, the IT solution vendor may seek to calculate the total amount of CO2 emissions being suppressed by a range of different solutions that they provide, and visually represent the total amount of CO2 emissions suppression from their products and services over a period of one or multiple years. In such cases again, we believe that certain rules and lines of thinking must be defined on how to carry out calculations and aggregation.
The quantification of CO2 emissions suppression is also needed for verifying the status of efforts being taken by industry as a whole to counter global warming. For the purpose of promoting improvements in energy efficiencies in production processes and suppression of CO2 emissions through products and services, the Liaison Group of Japanese Electrical and Electronics Industries for Global Warming Prevention is engaged in establishing uniform and cogent methods for calculating the amounts of CO2 emissions being suppressed, and also publishes fiscal-yearly performance figures for the electrical and electronics industries. The group has so far carried out calculations for 22 cases of IT solutions on the amounts of CO2 suppressed for society at large. Of these, calculation methods were defined for two IT solution items: remote conferencing and digital tachographs, and their CO2 emissions suppression performance has been published. (GIPC assisted in developing the calculation method.)
These published calculation methods have been designed to enable users to choose the appropriate method

for their level of understanding. Moving forward, similar calculation methods must be developed for calculating the performance of other IT solutions.

1.4 Composition of this report

In this report, we review Green by IT, specifically the framework for the quantification of CO2 emissions suppression amounts (umbrella method for calculation and aggregation; hereafter referred to as "Quantification Framework"), and summarize the methods for quantifying amounts of CO2 emissions suppression, including simplified methods of calculation. In this committee, we have gathered examples of calculations that were made by member companies based on the GIPC Explanatory Booklet, to systematically consolidate and summarize the processes and results of quantification. Particularly in this report, we present calculation methods for making simplified calculations for the amounts of CO2 emissions being suppressed based on data that can be realistically gathered, without having to prepare detailed parameters or data.

This report is composed of Chapters 1 and 2, which discuss the history and objectives, Chapter 3, which presents the line of thinking behind the Quantification Framework, Chapter 4, which summarizes how to derive simplified solution-specific coefficients, Chapter 5, which describes specific calculation and aggregation procedures, and finally Chapter 6, which summarizes challenges and other matters of concern as we move forward with the active implementation of methods for evaluating IT solutions.

2. Overview

In this chapter, we will be discussing the basic line of thinking behind the methods of quantification that we have discussed, and issues being addressed by the committee with regard to the calculation and aggregation of CO2 emissions suppression from IT solutions.

2.1 History and objectives

The implementation of IT solutions holds the promise of advancing greater efficiencies in business operations and activities, and through this, contributing to the resolution of environmental issues faced by society at large. For example, the implementation of TV conferencing has the direct effect of reducing the number of business trips for those taking part in the conference, and is also believed to reduce the amount of personal and vehicular travel, ultimately having the ripple effect of suppressing CO2 emissions. For reasons such as this, in the context of countering global warming, there is an increasing need to make calculations of the amounts of CO2 emissions that can be suppressed with the use of IT solutions. Given this state of affairs, the Green IT Promotion Council (currently JEITA Green IT Committee) prepared the GIPC Explanatory Handbook, and since then, multiple IT solution vendors and other organizations have carried out trial calculations on CO2 emissions suppression amounts.
The effects that IT solutions have in suppressing CO2 emissions can be grouped into eight categories (hereafter referred to as "components"; Table 1). In each component, the differences in quantities that are affected by IT solution implementation (hereafter referred to as "activity quantity") multiplied by the coefficient that converts activity quantities to CO2 emissions (hereafter referred to as "primary unit") constitutes the amount of CO2 emissions being suppressed. Here, the primary unit constitutes CO2 emissions per unit activity quantity based on the presumption that activity quantities and CO2 emission amounts are proportional. And, the amount of CO2 emissions suppression enabled by a particular IT solution can be calculated by totaling the amount of CO2 emission suppression for each of the calculated components.

Table 1: Components of the effects of IT solutions, and formulae for their calculation

Components	Component subjects	Component calculation formulae
(1) Consumption of material	Paper, CDs, books, etc.	Reduction in consumption of material x Primary unit of consumption of material
(2) Amount traveled by persons	Aircraft, automobiles, trains, etc.	Reduction in personal travel distance x Primary unit of travel
(3) Amount traveled by items	Trucks, railroad, cargo, etc.	Reduction in item travel distance x Primary unit of travel
(4) Office space	Space occupied by persons (including work efficiency), space occupied by IT equipment, etc.	Space reduction x Primary unit of energy consumption per space ** Space reduction equals the number of persons reduced multiplied by the space occupied per person, or the number of pieces of equipment reduced multiplied by the space occupied per piece of equipment.*
(5) Warehouse space	Warehouses, refrigerated warehouses, etc.	Space reduction x Primary unit of energy consumption per space
(6) Electricity and energy consumption (IT and network equipment)	Power consumed by servers, PCs, etc.	Amount of change in power consumption x Primary unit of grid power ** This applies when converting electrical power into CO2 emissions.* ** This represents the amount of energy consumed from the use of IT equipment, and does not include energy consumed for the manufacture or disposal of such equipment.*
(7) Network data communication volume	Network data communication volume	Amount of change in data communication volume x Primary unit associated with data communication ** The amount of energy consumed for network communications includes energy consumed for Internet communications, but not intranet communications.*
(8) Other	Activities other than the above	Amount of change in activity x Primary unit of the amount of change

That being said, several issues exist with regard to actually calculating the amounts of CO2 emissions being suppressed from the use of IT solutions. The first issue has to do with the difficulties in defining usage conditions before and after implementation. For example, in the implementation of TV conferencing systems, the number of user sites and users will typically vary from location to location, which makes it difficult to ascertain actual conditions. In order to quantify the reduction in personal travel enabled by TV conferencing, data will be needed on the variations in the number of individuals making business trips, as well as on travel distances covered on business trips. Data on the primary unit used for converting activity quantities into CO2 emissions will also have to be gathered. Calculators must either prepare primary units based on the power consumption of the railroad trains that are used for business trips and the greenhouse gas emissions coefficient of electrical power, or look up average primary units relating to personal travel. These types of data gathering tasks are rarely straightforward.

For this reason, the precision of the calculations is determined by the precision of the parameters and data that can be prepared. In cases where the calculator (IT solutions vendor, etc.) is able to prepare detailed parameters and data on their own, there is a greater chance that results from the calculation will be rigorous and cogent. Meanwhile, in cases where it is not straightforward for the calculator to prepare these parameters and data on their own, standard or hypothetical data that is generally available must be used, in which case the possibility that these calculations will yield rigorous and cogent results is highly questionable. Given this situation, and based on the assumption that CO2 emissions suppression amounts will be calculated according to the GIPC Explanatory Booklet, this committee has categorized the parameters and data that can be prepared into the levels shown in Fig. 1 according to their precision (Calculation Levels 1-3).

Indeed, because calculations for CO2 emissions suppression amounts are difficult to carry out for the majority of IT solution vendors and other calculators even with the help of the GIPC Explanatory Booklet,

we have received requests for more straightforward methods of calculation. With the aim of addressing these needs, in this report, we have compiled examples of calculations based on the GIPC Explanatory Booklet that were previously carried out by member companies to provide a summary of calculation processes, and a systematic aggregation of results. The committee proposes a method for calculating amounts of CO2 emissions being suppressed using data that can be realistically gathered without the need for preparing detailed parameters or data.
Our objective is to enable more IT solution vendors and other calculators to use these calculation methods to calculate CO2 emissions suppression amounts, and leverage this information in their business operations, as well as in their contributions to global warming countermeasures for society at large.

2.2 Reviews on methods for quantifying CO2 emissions suppression amounts

2.2.1 Framework for the quantification of CO2 emissions suppression amounts

The chart below shows a systematic schematic of the traditional methods for calculating CO2 emissions suppression amounts based on the GIPC Explanatory Booklet. The new simplified calculation method being proposed has been added to Calculation Level 3. This flow has been named the "Framework for the quantification of CO2 emissions suppression amounts" and is commonly referred to as the "umbrella method" at the committee.

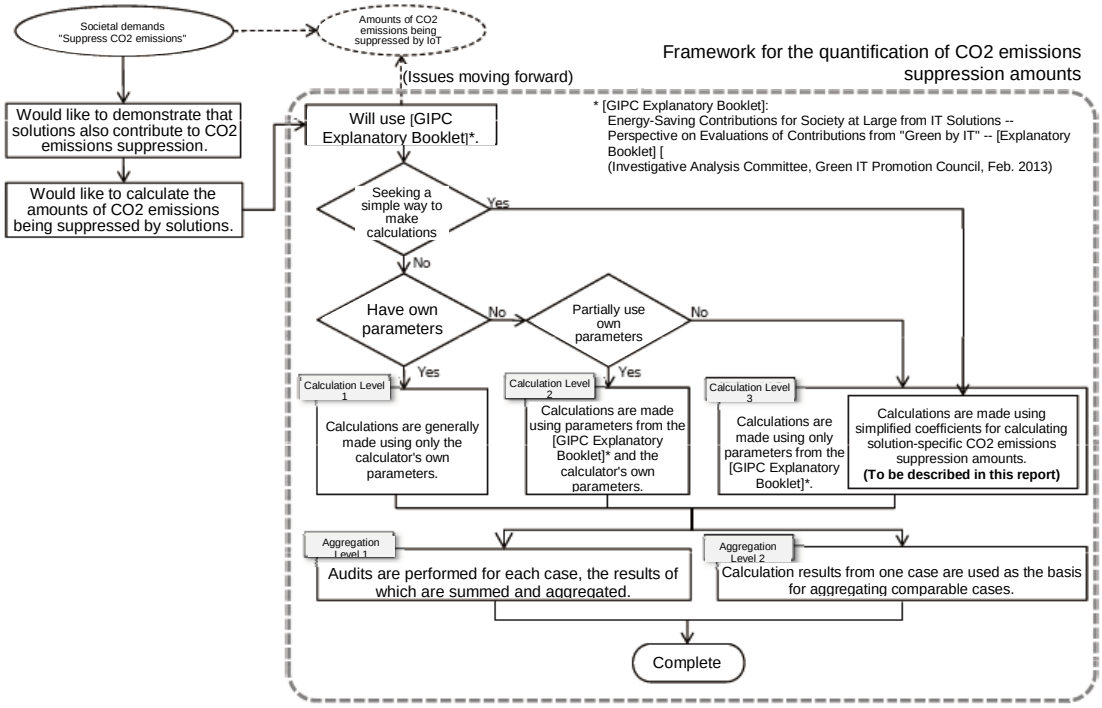


Fig. 1: Framework for the quantification of CO2 emissions suppression amounts

2.2.2 Simplified solution-specific coefficients for calculating CO2 emissions suppression amounts

In this newly proposed simplified calculation method, we have defined representative parameters that were aggregated from results of calculations previously made by member companies based on the GIPC Explanatory Booklet, and can be applied to calculations of solution-specific CO2 emissions suppression amounts. These are referred to as the "Simplified solution-specific coefficients for calculating CO2 emissions suppression amounts" (hereafter referred to as "simplified calculation coefficients").

2.3 Calculation Levels and Aggregation Levels

(1) Calculation Levels
This committee defines "Calculation Levels" as shown in Table 2. Based on the premise that CO2 emissions suppression amounts will be calculated based on the GIPC Explanatory Booklet, calculation precision was categorized into Calculation Levels 1 thru 3 to match the precision of the parameters and data that can be prepared. Calculation Level 1 provides higher precision, and Level 3 indicates lower precision. While the new simplified calculation method reviewed in this report is grouped in Calculation Level 3, the calculator must thoroughly examine whether the prepared activity quantities and other parameters are similar to that used in this method, in order to perform actual calculations. Even if the solution appears to be similar at first glance, the use of this method should be avoided if the calculator has any uncertainties.

(2) Aggregation Levels (Aggregation of calculated values)
This committee defines "Aggregation Levels" as shown in Table 3. The configurations and scale of IT solutions will be different from case to case even if they are of the same type (solutions that are used to solve the same problem). For this reason, although it would be ideal to sum up the values calculated for all solutions of the same type that are in use in our societies to accurately calculate the total amount of CO2 emissions suppression by these solutions, this is unrealistic as it will involve too many man-hours. Simplified aggregations of values for representative solutions can be calculated by defining a coefficient, such as for scale, and multiplying it by n.
Additionally, this applies to the method for summing up the effects of solutions of different types (solutions with different solution objectives). For these reasons, this report goes only as far as to present the differences in aggregation levels and the issues thereof; it is up to the aggregator to decide which level at which to perform the aggregation.

Table 2: Calculation Level definitions

Calculation Level	Calculation method	Components of the effect to be calculated	Activity quantity	Primary unit
1	- The evaluator performs the calculation based on the [GIPC Explanatory Booklet], taking into account the user's operations. - Effects are calculated based on actual examples.	- Components are determined based on the [GIPC Explanatory Booklet], taking into account the user's operations. - Components are determined taking into account the states before and after implementation.	The evaluator defines the activity quantity according to the user's operations, and performs the calculations.	Primary units that the evaluator deems to be the most appropriate are used.
2	Using the information in this report, simplified CO2 emissions suppression amounts are estimated and calculated based on similar examples.	Components are defined by combining, as needed, components that are made to match examples at different companies, and components that are defined in this report.	Calculations are made by choosing, as needed, activity quantities that are made to match examples at different companies, and activity quantities that are defined in this report.	Primary units that are made to match examples at different companies, and primary units that are defined in this report are chosen and used as needed.
3		Components that are defined in this report are used.	Calculations are made using activity quantities that are defined in this report.	Primary units that are defined in this report are used.

Table 3: Aggregation Level definitions

Aggregation Level	Aggregation method	Aggregation formula	Precision
1	Calculations are made for each case, and the results thereof are summed up and aggregated.	CO2 emissions suppression amounts are calculated for each solution, and summed up.	Relatively high
2	Similar cases are aggregated based on calculation results from a single case.	Based on calculation results from a single case, representative examples including other cases are created from coefficients, activity quantities and other parameters, which are then summed up. Ex: One calculation result x n	Relatively low

2.4 Definition of terms

Table 4 lists the definitions of key terms used in this report.

Table 4: Definition of terms

Term	Definition
CO2 emissions suppression amount	This is the amount of CO2 emissions suppression that the implementation of a particular IT solution is expected to achieve. Based on scenarios that can be achieved before and after implementation, the differences in CO2 emissions resulting from expected changes in activity quantities are used to make the calculation.
Framework for the quantification of CO2 emissions suppression amounts	This is a framework for selecting appropriate methods for calculating CO2 emissions suppression amounts from among multiple methods that use different Calculation and Aggregation Levels. (Referred to as "Quantification Framework" in this report)
Activity quantity	Quantities that are directly affected by the implementation of IT solutions ("Consumption of physical items", "Movement of people," etc.)
Primary unit	Coefficient for converting activity quantities into CO2 emissions
Solution-specific simplified coefficient for calculating CO2 emissions suppression amounts	This refers to representative parameters that can be applied to solution-specific calculations of CO2 emissions suppression amounts that have been aggregated from case results of calculations performed to date by member companies based on the GIPC Explanatory Booklet (referred to as "simplified calculation coefficient" in this report).
Calculation Level	Level as determined by the method of calculating the effects of a particular solution (See Table 2.)
Aggregation Level	Level as determined by the method of summing up and aggregating the effects of multiple solutions (See Table 3.)

3. Line of thinking behind the framework for the quantification of CO2 emissions suppression amounts

In reference to the new "Quantification Framework" and solution-specific "simplified calculation coefficients" that we review here, procedures for selecting appropriate calculation methods from among a number of methods have been organized in a comprehensive (umbrella) fashion in the Quantification Framework. In this chapter, we discuss the line of thinking behind this organizing of procedures.

In Chapter 2, we showed that there were a broad range of applications for the quantification of CO2 emissions suppression amounts, and that Calculation and Aggregation Levels will vary from application to application. The amount of data and man-hours required will vary considerably depending on the Calculation or Aggregation Level. In the Quantification Framework, we have summarized procedures for selecting the appropriate method according to the application and data available.
Figure 1 shows the procedures for selecting a method for quantifying CO2 emissions suppression amounts. While there are many lines of thinking with regards to the calculation of CO2 emissions suppression amounts, this Quantification Framework is based on the line of thinking behind the quantification of "Green by IT" CO2 emissions suppression amounts that have been reviewed to date (See Section 2.1, and reference document (7) in Chapter 1 [GIPC Explanatory Booklet], etc). Characteristics of this method include the following.

- Contributions (effects) to society at large from Green by IT are quantified.
- CO2 emissions suppression effects are categorized in the form of the components shown in Table 1, and consistent calculations are carried out.
- Standard forms of primary units that are needed for calculations are provided for greater ease of use.

As such, in cases where an organization seeks to calculate the in-house energy costs of a customer, and not that of society at large, a separate method of calculation must be used after changing boundary designations and other attributes.
Even in cases where the line of thinking behind the GIPC Explanatory Booklet is applied, calculation methods and precision will vary widely depending on the available data and application. The Quantification Framework recommends that those methods (Fig. 1) that provide greater precision (Level 1, etc) should be the first to be reviewed.
For example, in applications that require high levels of precision, and where primary units and data such as representative values can be gathered independently, it is recommended that calculations be carried out based on the GIPC Explanatory Booklet (Level 1). That being said, there are many cases where it can be difficult to gather all primary units or data on representative values. And, in some cases, a solution may be expected to provide a unique type of CO2 emissions suppression effect owing to its unique functions, or its primary unit may be considerably different from standard values.
In such cases, it is preferable to selectively use the standard primary units and representative values listed in the GIPC Explanatory Booklet, and use the unique effects and data in addition to perform calculations (Calculation Level 2). Finally, there may be cases where it is difficult to gather representative values, or where a simple way of calculating approximated CO2 emissions suppression amounts is sought. In such cases, a method for calculating approximated CO2 emissions suppression amounts based on solution-specific "simplified calculation coefficients," which have been created from the representative usage and primary unit for the solution (Calculation Level 3), can be chosen. That being said, since Calculation Level 3 is a simplified method of calculation and results from this method are likely to contain large margins of error, we have been conservative with CO2 emissions suppression amounts in the process of deriving these solution-specific "simplified calculation coefficients".

In cases where calculations that incorporate individual conditions are sought, it would be most appropriate to consider Level 2 calculations.
We believe that, by using these procedures to select calculation and aggregation methods, users will be able to choose the appropriate calculation and aggregation methods from among many other methods.

4. Deriving solution-specific "simplified calculation coefficients"

Solution-specific "simplified calculation coefficients" represent the amount of CO2 emissions suppression and are derived from aggregating representative configurations and implementation scenarios for each solution. The line of thinking behind this is described in this chapter.

4.1 Overview of the simplified calculation coefficient

In the Quantification Framework, a simplified calculation of CO2 emissions suppression amounts can be made using the simplified calculation coefficients presented in this report, based on parameters such as the number of IT solutions shipped. All of the "components of the effect to be calculated," "activity quantities," and "primary units" that have been used to derive these coefficients come from representative model values based on data from examples that this committee has gathered. The committee includes this as one method of calculation in Calculation Level 3.
Because a representative scenario is a prerequisite for deriving these coefficients, the decision whether or not to apply them must come from reviews on how similar a scenario is to the actual state of implementation or the form of solution. If the actual state of implementation is deemed to be not similar to the defined scenario, the use of this calculation method should be avoided.
In deriving these coefficients, the committee gathered examples from member companies, and aggregated these into representative system configurations and implementation scenarios. Parameters that may affect CO2 emissions suppression amounts (number of locations or shops where the solution is implemented, etc.) were also considered.
Firstly, in gathering the examples, we referred to the categorizations and IT solution examples that were reviewed by the Green IT Promotion Council (currently the Green IT Committee; Table 5). In doing so, we also included tape storage solutions that were reviewed by the Working Group for the Promotion of Energy-Saving Storage Implementation. Additionally, solutions that were designed to solve similar issues were consolidated into one group.
Next, representative system configurations and implementation scenarios were defined based on these examples, and the representative CO2 emissions suppression amounts for each of these consolidated solutions were calculated.

Table 5: IT solutions reviewed

Category		No.	IT solution (GIPC version)	Solutions for which simplified calculation coefficients were reviewed in this report
Industry	Factory	1	FEMS (Factory Energy Management System)	-
	Production	2	Greater efficiency for lighting, air-conditioning, motors, and generators	-
		3	Greater efficiency in production processes	Greater efficiency in production processes
Operation	Building	4	BEMS (Building Energy Management System)	BEMS
	Indoors	5	Electronic tags, logistics systems	-
		6	Paperless office	Paperless office
		7	Implementation of IT in operations (e-Learning, etc)	Delivery management systems e-Learning
		8	Teleworking	Teleworking
		9	TV conferencing [remote conferencing system]	TV conferencing
		10	Remote medicine, electronic medical records	Remote consultation
		11	Electronic bidding, electronic applications	Electronic procurement
Home	Building	12	HEMS (Home Energy Management System)	-
	Indoors	13	Electronic money	-
		14	Electronic publishing, electronic applications	Electronic publishing, electronic applications
		15	Music distribution, software distribution	-
		16	Online shopping	-
Transport	Infrastructure	17	Traffic light conversion to LED (Smart application)	-
	Activities	18	ITS (Intelligent Transport System)	-
		19	Improve automobile fuel consumption	-
		20	Greater efficiency in modes of transportation	-
		21	Eco-driving [digital tachograph systems]	Eco-driving
Operation	Additional*	22	Tape storage	Tape storage
Other		23	Solutions other than the above	

Examples reviewed in this report

* Tape storage solutions that were reviewed by the Working Group for the Promotion of Energy-Saving Storage Implementation were added.

4.2 The process of deriving simplified calculation coefficients

The following is a detailed description of the process based on the example of TV conferencing systems.

[Example: TV conferencing]
Based on a variety of examples, we defined the representative model for TV conferencing to be a setting where there would be two sites (Tokyo and Osaka) and three meeting participants per site. Prior to the implementation of TV conferencing in these examples, personnel from either one of these sites would travel to the other site for the meetings. While personal travel would no longer be needed after the implementation of TV conferencing, the IT equipment that run the TV conferencing system will require power (Table 7). The difference in states before and after the implementation of the TV conferencing system is deemed to be the amount of CO2 emissions suppressed.

Table 6: Representative TV conferencing system

Representative item	Representative value	Unit
Conference frequency	45.76	Number of times per year
Sites	2	Sites
Participants	3	Number of participants/site
Travel distance (public transportation)	1,200	km (round trip)
Average conference duration	1.15	Hours/conference
IT equipment power consumption (after implementation)	67.0	kWh/year

Table 7: TV conferencing system's equipment configuration

Components	Number of units	Power consumption W/unit	Hours of operation	Annual days of operation	Sites	Total kWh/year
TV	1	500	1.15	45.76	2	52.6
PC/Server	1	100	1.15	45.76	2	10.5
Control equipment	1	32	1.15	45.76	2	3.4
Mic, camera	1	5	1.15	45.76	2	0.5
Total	-	637	-	-	-	67.0

The following is the CO2 emissions suppression effect of a representative TV conferencing system shown in Tables 6 and 7.

(1) Before implementing TV conferencing

Annual CO2 emissions = Travel distance (round trip) x Primary unit of travel (by train) x Number of participants x Conference frequency
= 1,200km x 0.005 kg-CO2/(person kilometers) x 3 x 45.76 conferences/year
≈ 824 kg-CO2/year

(2) After implementing TV conferencing

Annual CO2 emissions = IT equipment power consumption x Average conference duration x Conference frequency x Electrical power primary unit
= 0.637kW x 1.15h x 45.76 conferences x 0.425kg CO2/kWh
≈ 28 kg-CO2/year

(3) Amount of CO2 emissions suppression from using TV conferencing

The amount of CO2 emissions suppression from using TV conferencing is calculated from the difference between (1), before implementation, and (2), after implementation, shown above. However, as shown in Tables 6 and 7, the representative TV conferencing configuration is the sum of two sites. By defining the basic unit as a single site, we have:

Amount of CO2 emissions suppressed from using TV conferencing
= (pre-implementation CO2 emissions minus post-implementation CO2 emissions)/number of sites
= (824 kg-CO2/year - 28 kg-CO2/year)/two sites
= 398 kg-CO2/(site year)

The third and smaller digits are rounded to the first two digits that are defined to be the effective value of the simplified calculation coefficient for TV conferencing. This gives a value of 390 kg-CO2/(site year).

(4) Amount of CO2 emissions suppression from TV conferencing systems supplied to the market over a period of one year

The following total can be calculated by ascertaining the number of sites to which TV conferencing systems were provided over the period of one year.

Amount of CO2 emissions suppression from TV conferencing systems supplied to the market
= "Simplified calculation coefficient" for TV conferencing x Number of supplied sites in the market (n)
= 390 x n kg-CO2/year.

4.3 Results of simplified calculation coefficient derivation

Simplified calculation coefficients were derived for other types of solutions just as we did for TV conferencing systems. In the example of TV conferencing, it was deemed that the CO2 emissions suppression amount was proportionate to the number of systems supplied to the market. However, because the proportional relationship between specific parameters and the amount of CO2 emissions suppression will vary from solution to solution, reviews were carried out for each solution and the relevant parameters were presented as "basic units" (number of clients, number of shops, number of target individuals, etc).
Table 8 shows a summary of the results of deriving the simplified calculation coefficient and the solution-specific basic units that we have reviewed.

The representative values and units shown in the table are the simplified calculation coefficients for each solution. If a particular solution is similar to one shown in Table 8, the approximate amount of CO2 emissions suppression for that solution can be calculated by acquiring the number of clients, sites, shops and other data relating to the solution's implementation, and multiplying them by the representative values shown in Table 8.

Table 8: List of solution-specific simplified calculation coefficients

Categories		IT solution				Basic unit	Simplified calculation coefficient	Unit
Broad category	Sub-category	IT solution category	Solution	Appendix no.	Class, conditions			
Industry	Production process	Greater efficiency in production processes	QC operations solution	A1.1	-	Client	4	kg-CO2/(client year)
Operation	Building	BEMS (Building energy management system)	BEMS (Building energy management system)	A1.2	Floor area 10,000m^2 or greater[*1]	m^2	1.1	kg-CO2/(m^2 year)
					Floor area less than 10,000m^2[*2]	m^2	0.45	kg-CO2/(m^2 year)
	Indoors	Paperless office	e-document solution	A1.3	Small rate of paper consumption	Shop	1,200	kg-CO2/(shop year)
		Paperless office	Electronic forms	A1.4	Large rate of paper consumption	Shop	2,000	kg-CO2/(shop year)
		Delivery management system	Customer and delivery destination information management system	A1.5	-	Client	110	kg-CO2/(client year)
		e-Learning	e-Learning system (remote learning system)	A1.6	-	Client	60	kg-CO2/(client year)
		Teleworking	Teleworking	A1.7	-	Client	200	kg-CO2/(client year)
		TV conferencing (remote conferencing)	TV conferencing (regular definition)	A1.8	Regular definition	Site	390	kg-CO2/(site year)
			TV conferencing (high definition)	A1.9	High definition	Site	140	kg-CO2/(site year)
		Remote medicine, electronic medical records	Remote consultation	A1.10	-	Number of target individuals	4	kg-CO2/(person year)
		Electronic procurement	Central management solution for administrative work	A1.11	-	Client	7,000	kg-CO2/(client year)
Home	Indoors	Electronic publishing, electronic applications	Solution for managing administrative rules	A1.12	-	Client	4,000	kg-CO2/(client year)
Transport	Activity	Eco-driving	Digital tachograph	A1.13	-	Client	2,100	kg-CO2/(client year)
Operation	-	Tape storage	Tape storage system	A1.14	Archive data 400TB	Site	9,000	kg-CO2/(site year)

[*1] Presumes the effects of BEMS equipped with control functions.
[*2] Presumes the effects of BEMS through the visualization of energy usage.

Procedural explanations

5. Specific calculation and aggregation procedures

In this chapter, we discuss the procedures for calculating and aggregating CO2 emissions suppression amounts based on the established Quantification Framework.

5.1 Calculation procedures (Choosing the appropriate method of calculation)

Depending on the purpose of calculating the amounts of CO2 emissions suppression, the appropriate Calculation Level shall be chosen according to the flow shown in Fig. 1.
In cases where the calculator is able to prepare the parameters and data to use for the calculation, Calculation Level 1 or 2 may be used. In cases where it is difficult for the calculator to prepare parameters and data on his/her own, calculations shall be made using Calculation Level 3. To make simplified calculations, the simplified calculation coefficients presented in this report (Table 8) shall be used, and the Calculation Level will be 3. However, because simplified calculation coefficients are currently not available for solutions other than those shown in Table 8, the calculator will need to make calculations based on the GIPC Explanatory Booklet as needed.

[Detailed procedure]

(Step 1) If independent data on the primary unit, usage of the implemented system, and system configuration are sufficiently available, consider whether Calculation Levels 1 or 2 can be used.

- Level 1 applies to cases where all of the data, including primary units, can be gathered independently.
- Level 2 applies if the calculation will partially use primary units and other values presented in this report.
- For details, see the calculation methods shown towards the end of this document (Appendix A2) and the GIPC Explanatory Booklet.

(Step 2) If independent data on the primary unit, usage of the implemented system, and system configuration are not sufficiently available, consider whether Calculation Level 3 can be used.

- You will need to have data that are in line with the parameters presented in the GIPC Explanatory Booklet.
- Calculations using simplified calculation coefficients are also an option. (See the next section.)

(Step 3) If the calculator seeks to make provisional calculations of approximate values, and is unable to prepare sufficient data in Step 2, consider using the simplified calculation coefficients.

- The calculator will need to prepare data (number of shops, etc.) that can be applied to Table 8. (See the next section.)

5.2 Calculation procedure using simplified calculation coefficients

[Detailed procedure]

(Step 1) From the solutions listed in Appendix A1, choose a solution of the same type in Table 8 that you wish to make calculations for.

(Step 2) Consider whether or not the applicable solution in Appendix A1 and the solution that you seek to make calculations for are similar. Their similarity shall be determined based on the "similarity of solution configuration and purpose" and "similarity of effects (eight effects) that result from the solutions' specifications." Results of this determination are dependent on the calculator.

Note 1) Compare the descriptions of solutions in Appendix A1 ("Overview" "Configuration and CO2 emissions suppression effects of representative solutions") and the solution that you seek to make calculations for, to consider whether or not they are similar.

Note 2) Consider whether effects similar to the "CO2 emissions suppression effects" attributed to solutions in Appendix A1 can be expected from the solution that you seek to make calculations for.

Note 3) If the solutions can be deemed to be not similar, consider whether calculations can be made at Level 1 or 2 based on the GIPC Explanatory Booklet.

[Calculation example]

The following is an example of a calculation where the solution that you seek to make calculations for is deemed to be similar to a solution where simplified calculation coefficients can be used.

(Step 1) Acquire information needed for the calculation.

Data required to make Level 3 calculations are the values of quantities that correspond to the solution's primary units. Acquire or estimate data that are in line with Table 8 (number of shops, etc).

(Step 2) Apply the gathered data and applicable simplified calculation coefficients to the following formula to calculate the CO2 emissions suppression amount.

(CO2 emissions suppression amount) = (Simplified calculation coefficient) x (Data gathered in Step 1)

The result of the calculation will be an approximate value that is different from the actual state of the solution's implementation.

We also recommend that the calculator maintain a record of how the results were calculated, as well as mention the Calculation Level that the calculation belongs to in the remarks area or other area.

5.3 Specific aggregation procedures

Several scenarios are conceivable for summing up the CO2 emissions suppression enabled by multiple solutions.

- Summing up the effects of solutions of the same type
- Summing up the effects of solutions of different types
- Summing up the effects of solutions supplied by more than one vendor
- A mixture of the above

Table 9 lists examples of such cases. While Calculation Levels 1 thru 3 can be considered for these examples, it is preferable to match their Calculation Levels as much as possible for aggregation and summing up.

Table 9: Cases of summing up more than one emissions suppression amount

Category	Case
Summing up the amount of CO2 emissions suppression enabled by solutions of the same type[*1]. (*1: Solutions designed to solve the same issues)	To indicate the sum of CO2 emissions suppression effects enabled by solutions of the same type that are supplied by one or more IT solution vendors: [Ex 1] Case where vendor A has supplied customers a, b, c and so forth with TV conferencing systems → Σ (CO2 emissions suppression amounts at each customer [a, b, c ....]) [Ex 2] Case where vendor A has supplied customers a, b, c and so forth with TV conferencing systems, and vendor B has supplied customers 1, 2, 3 and so forth with remote conferencing systems → Σ (CO2 emissions suppression amounts at each of vendor A's customers [a, b, c ....]) +Σ (CO2 emissions suppression amounts at each of vendor B's customers [1, 2, 3 ....])
Summing up the amount of CO2 emissions suppression enabled by solutions of different types[*2]. (*2: Solutions designed to solve different issues)	To indicate the sum of CO2 emissions suppression effects enabled by multiple solutions that vendors supply to society at large: [Ex 1] Σ (CO2 emissions suppression amount from vendor A's solutions I, II, III ...) [Ex 2] Σ (CO2 emissions suppression amount from vendor A's solutions I, II, III ...) +Σ (CO2 emissions suppression amount from vendor B's solutions 1, 2, 3 ...)

5.4 Examples of calculating and aggregating CO2 emissions suppression amounts using simplified calculation coefficients

5.4.1 Examples of aggregating the total amount of CO2 emissions suppression enabled by solutions of the same type

The following are explanations for the aggregation of CO2 emissions suppression amounts based on the example of TV conferencing systems that are supplied by two vendors.

Table 10: "TV conferencing systems" sold by vendor A in FYxxxx

No.	User	Number of sites	Shipped to
1	a	100	Kansai area
2	b	500	Nationwide
3	c	50	City X
4	d	100	Kansai, Kanto and regions in between
-	-	-	-
Total	-	4,000	-

Table 11: "TV conferencing systems" sold by vendor B in FYxxxx

No.	User	Number of sites	Shipped to
1	1	50	Nationwide
2	2	400	Nationwide
3	3	200	Nationwide
4	4	1,000	Nationwide
5	5	300	Nationwide
Total	-	5,000	-

[Case: TV conferencing systems supplied by vendors A and B]
Tables 10 and 11 show the sales of TV conferencing systems (regular definition) by vendors A and B. Vendor A's sales areas are mostly centered in Kansa, Kanto, and the areas between, while vendor B sells to sites nationwide.

(1) Example of aggregating results for one vendor using Calculation Level 3
To ascertain CO2 emissions suppression amounts in a simplified manner (where the simplified calculation coefficients provided in this report are used):

- Calculation Level 3 is applied.
- Based on Table 8, the following applies to TV conferencing systems (regular definition):
  Simplified calculation coefficient = 390kg/CO2/(site year)
  Basic unit = site

From this, the amount of CO2 emissions suppression enabled by both vendors A and B can be calculated in simplified form below.

- Vendor A example, Number of sites: 4,000
  Amount of CO2 emissions suppression = Simplified calculation coefficient x Basic unit
  = 390kg/CO2/(site year) x 4,000 sites
  = 1,560,000 kg-CO2/year
  = 1,560 t-CO2/year
- Vendor B example, Number of sites: 5,000
  Amount of CO2 emissions suppression = Simplified calculation coefficient x Basic unit
  = 390kg/CO2/(site year) x 5,000 sites
  = 1,950,000 kg-CO2/year
  = 1,950 t-CO2/year

(2) Example of aggregating results for more than one vendor using Calculation Level 3

- Amount of CO2 emissions suppression from vendor A's TV conferencing system: 1,560 t-CO2/year
- Amount of CO2 emissions suppression from vendor B's TV conferencing system: 1,950 t-CO2/year
- Total amount of CO2 emissions suppression for vendors A and B
  Amount of CO2 emissions suppression from vendor A's TV conferencing systems + Amount of CO2 emissions suppression from vendor B's TV conferencing systems = 3,510 t-CO2/year

(3) Example of aggregating results for one vendor using Calculation Level 2

The following describes a case where a vendor seeks to ascertain the amount of CO2 emissions suppression enabled by the sales of TV conferencing systems using its own activity quantities and other parameters, taking into account real-world conditions.

[Calculation Level 2 is applied]

Vendor B ships its systems nationwide, and since their effects can be expected to be larger than the simplified calculation coefficient shown in Table 8 for TV conferencing, vendor B creates a simplified calculation coefficient for their TV conferencing system (vendor B) to ascertain their CO2 emissions suppression amounts. Calculations for vendor B's TV conferencing system are performed by creating, in-house and based on the GIPC Explanatory Booklet, a coefficient that corresponds to the simplified calculation coefficient.

- Representative usage conditions of vendor B's TV conferencing system
  Conference frequency: 12 times/year
  Distances between sites: 800km (one way between Tokyo and Sapporo, or Tokyo and Fukuoka) where one person travels by air or rail.
  Simplified calculation coefficient created in-house (vendor B) = 850 kg-CO2/(site year)
- Vendor B example, Number of sites: 5,000
  Amount of CO2 emissions suppression = Simplified calculation coefficient (vendor B) x Basic unit
  = 850kg/CO2/(site year) x 5,000 sites
  = 4,250,000 kg-CO2/year
  = 4,250 t-CO2/year

5.4.2 Examples of aggregating the total amount of CO2 emissions suppression enabled by solutions of different types

The following are explanations for the aggregation of CO2 emissions suppression amounts based on the example of TV conferencing and teleworking systems. The case of TV conferencing and teleworking systems for one vendor is explained below.

Table 12: "TV conferencing systems" sold by vendor A in FYxxxx

No.	User	Number of sites	Shipped to
1	a	100	Kansai area
2	b	500	Nationwide
3	c	50	City X
4	d	100	Kansai, Kanto and regions in between
-	-	-	-
Total	-	4,000	-

Table 13: "Teleworking" systems sold by vendor A in FYxxxx

No.	User	Number of clients	Shipped to
1	I	250	Nationwide
2	II	10	Kyushu region
3	III	10	Kanto region
4	IV	100	Nationwide
5	V	30	Tohoku region
Total	-	400	-

[Case: TV conferencing and teleworking systems supplied by vendor A]

Tables 12 and 13 show vendor A's sales of TV conferencing (regular definition) and teleworking systems. These sales figures are for different types of solutions sold by the same IT solution vendor. Here, we provide examples of calculations for a case where the simplified calculation coefficient provided in this report is used (Calculation Level 3).

Based on Table 8, the following applies to TV conferencing systems (regular definition):

Simplified calculation coefficient = 390kg/CO2/(site year)

Basic unit = site

From this, the amount of CO2 emissions suppression enabled by vendor A's TV conferencing systems can be calculated in simplified form below.

Number of sites to which TV conferencing systems were sold: 4,000 sites

Amount of CO2 emissions suppression = Simplified calculation coefficient x Basic unit
= 390kg/CO2/(site year) x 4,000 sites
= 1,560,000 kg-CO2/year
= 1,560 t-CO2/year

Based on Table 8, the following applies to teleworking systems.

Simplified calculation coefficient = 200kg/CO2/(client year)

Basic unit = client

From this, the amount of CO2 emissions suppression enabled by vendor A's teleworking systems can be calculated in simplified form below.

Number of clients to which teleworking systems were sold (number of basic units): 400 clients

Amount of CO2 emissions suppression = Simplified calculation coefficient x Basic unit
= 200kg/CO2/(client year) x 400 clients
= 80,000 kg-CO2/year
= 80 t-CO2/year

Therefore, the sum of CO2 emissions suppression amounts from TV conferencing and teleworking systems sold by vendor A equals:

Amount of CO2 emissions suppression from TV conferencing systems + Amount of CO2 emissions suppression from teleworking systems
= 1,560 t-CO2/year + 80 t-CO2/year
= 1,640 t-CO2/year

The same calculations as above can be applied to solutions from multiple IT solution vendors.
Additionally, in cases where CO2 emissions suppression amounts are calculated by taking into account vendor A's actual sales performance without the use of the simplified calculation coefficient provided in this report, aggregations can be made using the CO2 emissions suppression amount as calculated in 5.4.1(3) above.

6. In utilizing methods for evaluating Green by IT

In this report, we have described how to calculate and aggregate the effects of IT solutions that can be expected to make major contributions towards CO2 emissions suppression moving forward.
It is thought that IT solutions used in our societies offer great potential for CO2 emissions suppression, and that by 2020, the emissions suppression potential for Green by IT is expected to reach between 68 and 137 million t-CO2/year as compared to that for Green of IT, which is expected to be between 21.4 and 42.8 million t-CO2/year.
It is expected that the suppression of CO2 emissions by way of IT solutions will be bolstered by using the methods introduced in this report to make quantitative evaluations of the impact that IT solutions have on society.

Meanwhile, methods for these evaluations are not without issues because IT solutions take a diverse range of forms. The simplified calculation procedures outlined in this report make use of representative models based on cases gathered by this committee, and therefore, readers should keep in mind that the following issues exist in quantifying CO2 emissions suppression amounts using these procedures.

[Reminders for users]

(1) The simplified calculation coefficients, with which representative models can be defined and effects can be calculated, are confined to the scope of Table 8. Simplified calculations of CO2 emissions suppression amounts enabled by IT solutions as described in this report (Calculation Level 3), are limited to solutions listed in Table 8. While we believe that this scope needs to be expanded moving forward, readers are asked to refer to the documents listed in Section 1.2 for non-applicable solutions.

(2) Even where calculations for CO2 emissions suppression amounts are sought for a solution included in Table 8, if an effect is foreseen to be divergent from that of a representative solution configuration included in the Appendix, it is preferable to use calculations that match the configurations at each company.

Ex) See the aggregation example for one company using Calculation Level 2 in 5.4.1 (3).

Representative models were created on the basis of one to several cases, and their configurations may differ from the solution whose CO2 emissions suppression amounts the user seeks to ascertain. In such cases, proceed in the same way as in (2) above.

Appendix

A1. Representative configurations of solutions

Greater efficiency in production processes

Solution

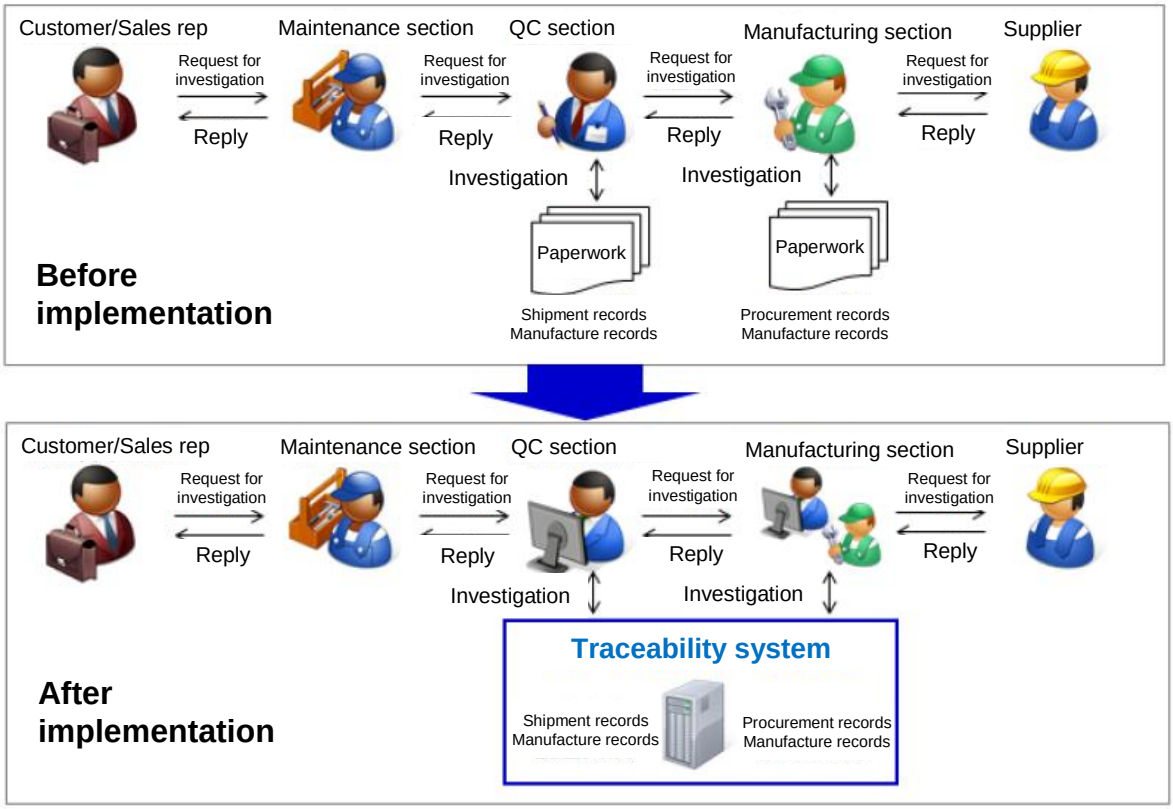
A1.1 QC operations solution

Overview:

Solution supports quality information management and market actions in the event of a product defect.

Representative solution configuration and its CO2 emissions suppression effects:

The solution is used to quickly gather, share, and analyze quality information, as well as visually represent the defect response actions to improve the efficiency of QC operations. It also reduces the use of paper in the areas of reducing "response lead time" and "cost of response" in the event of a defect, and contributes to the suppression of CO2 emissions.



CO2 emissions suppression effects

Consumption of physical items	Movement of people	Movement of physical items	Office space	Warehouse space	Power and energy consumption	Network data communication
○					○	

BEMS (Building energy management system)

Solution

A1.2 BEMS (Building energy management system)

Overview:

Improves the efficiency of energy use by visibly representing and controlling energy use in buildings.

Representative solution configuration and its CO2 emissions suppression effects:

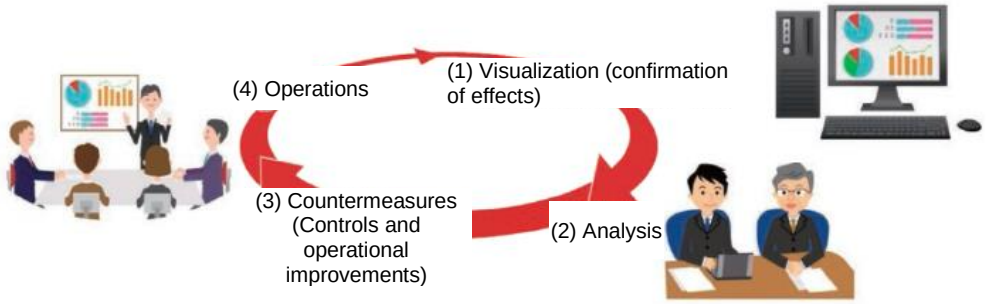
Before implementation

Energy management is performed by each building independently.

After implementation

The solution visually represents building energy use, analyzes it, implements countermeasures (controls and operational improvements), and carries out operations.

A roughly 2% improvement in energy efficiency is presumed from a BEMS with a visualization function, and a roughly 5% improvement by way of air-conditioning control from a BEMS with visualization and control functions.



(Source) JEITA Green IT Committee "Working Group for Promoting BEMS Implementation" document

(http://home.jeita.or.jp/greenit-pc/bems/index.html)

CO2 emissions suppression effects

Consumption of physical items	Movement of people	Movement of physical items	Office space	Warehouse space	Power and energy consumption	Network data communication
					○	○

Paperless office (with small rate of paper consumption)

Solution

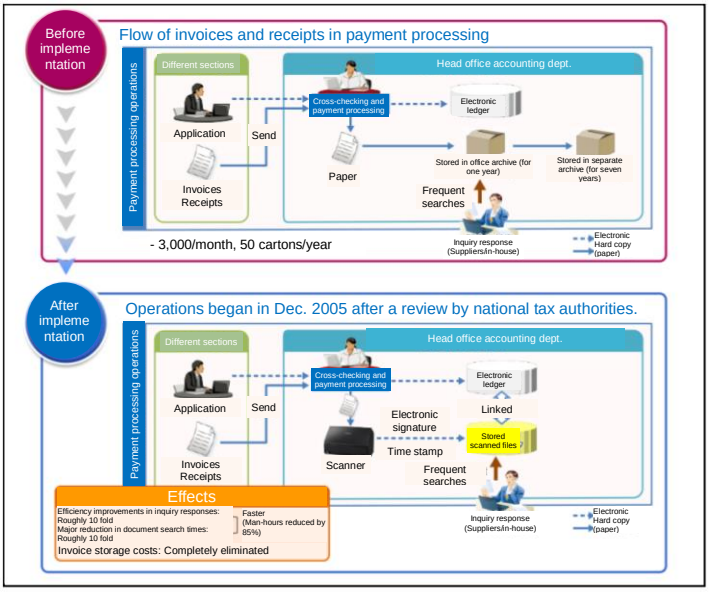
A1.3 e-Document solution

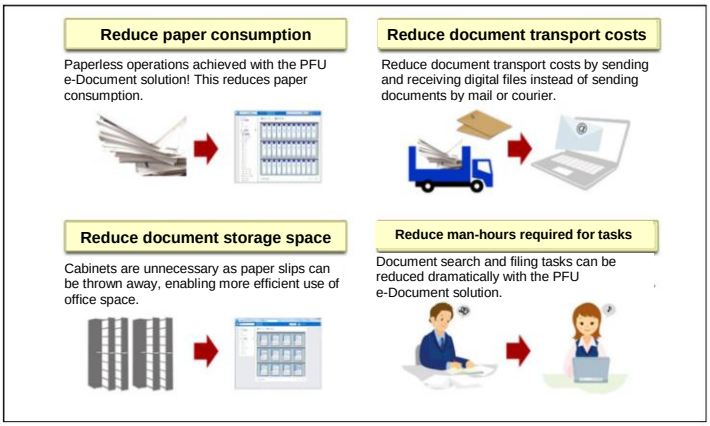
System that supports digitalization of slips, forms, and other documents

Overview

By digitalizing slips, forms, and other documents, this solution enables greater efficiency, and reduces paper, storage space, and document transport. Cabinets are unnecessary as paper slips can be thrown away, enabling more efficient use of office space. Tasks such as document searching and filing can be reduced, enabling reductions in man-hours.

Representative solution configuration and its CO2 emissions suppression effects:





CO2 emissions suppression effects

Consumption of physical items	Movement of people	Movement of physical items	Office space	Warehouse space	Power and energy consumption	Network data communication
○		○	○	○	○	

Paperless office (with large rate of paper consumption)

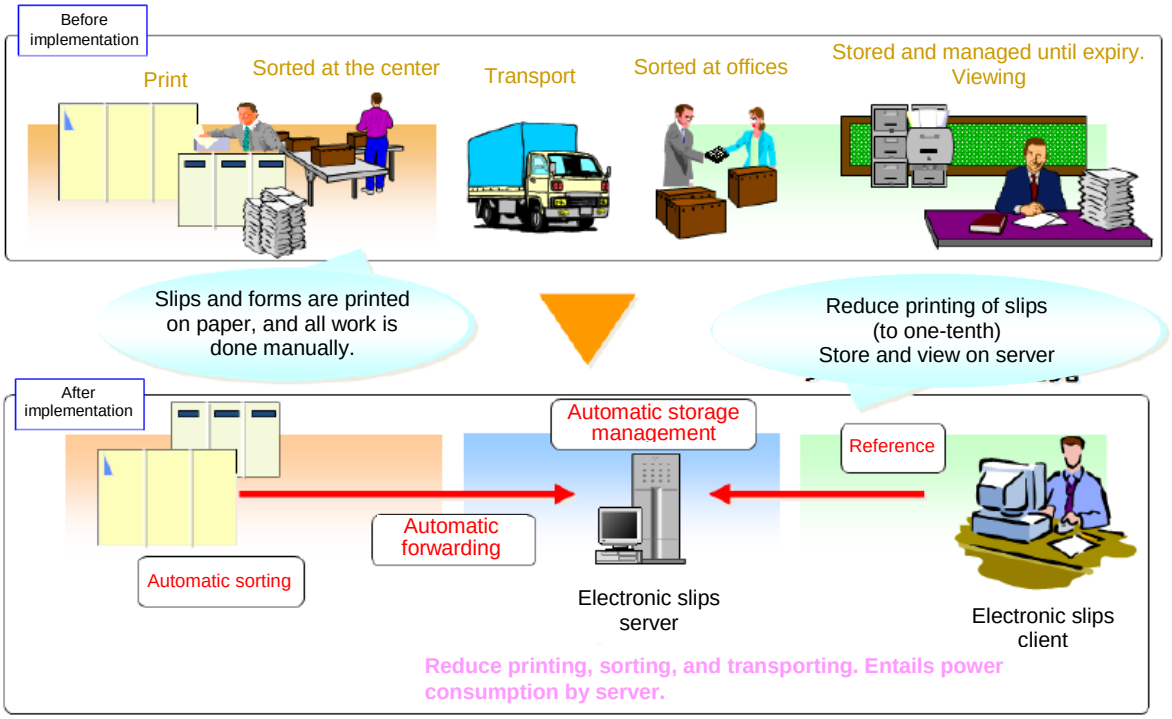
Solution

A1.4 Electronic forms system

Overview

The electronic forms system is a solution that enables large reductions in paper slips and forms used in administrative tasks for purchases, sales and other processes by digitalizing them. By reducing the number of printed slips and forms, efficiency can be achieved in sorting, distribution, searching, and storage.

Representative solution configuration and its CO2 emissions suppression effects:



CO2 emissions suppression effects

Consumption of physical items	Movement of people	Movement of physical items	Office space	Warehouse space	Power and energy consumption	Network data communication
○			○		○	

Delivery management system

Solution

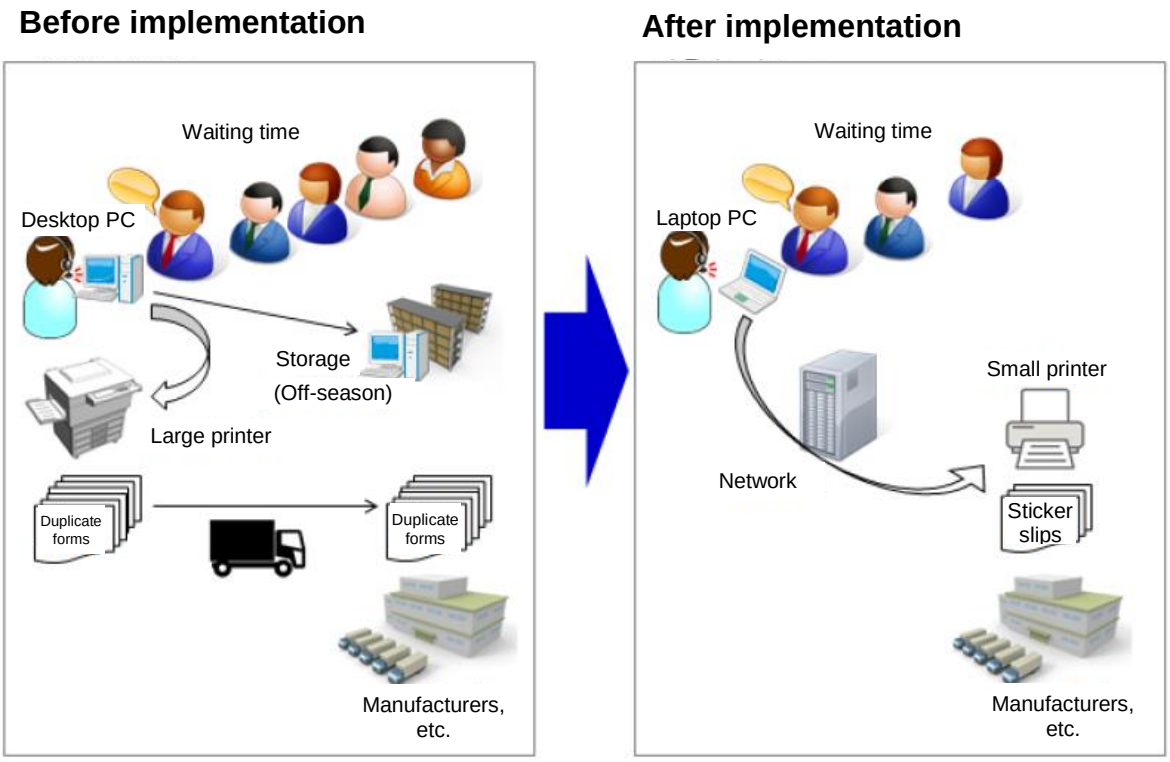
A1.5 Customer and delivery destination information management system

Overview:

Provides a system that supports operations that handle deliverable items throughout the year regardless of season by managing information on customers and delivery destinations.

Representative solution configuration and its CO2 emissions suppression effects:

Reduces customer interaction times with simple order-taking functions that run on the terminal devices being used. Allows users to select output destinations and printers for printing the forms, creating an optimized workflow. Sticker slips are used to reduce paper usage and contribute to the suppression of CO2 emissions.



CO2 emissions suppression effects

Consumption of physical items	Movement of people	Movement of physical items	Office space	Warehouse space	Power and energy consumption	Network data communication
○			○	○	○	

e-Learning

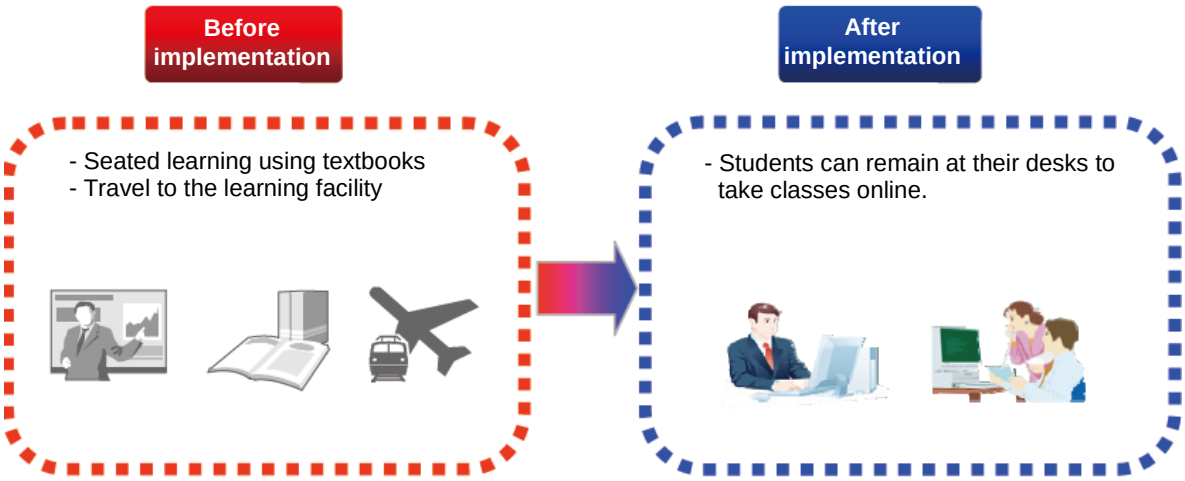
Solution

A1.6 e-Learning system (remote learning system)

Overview:

As opposed to traditional learning settings where the teacher and students convene at the same place and textbooks are handed out, this is a remote learning system using the Internet where the teacher prepares the class content at a location that suits the teacher, students take the class at a location and time that suits them, and textbooks are provided as digital files. This eliminates travel by road, rail, or air that was needed in traditional learning, and reduces excess waste of paper resources that were traditionally needed for making textbooks.

Representative solution configuration and its CO2 emissions suppression effects:



CO2 emissions suppression effects

Consumption of physical items	Movement of people	Movement of physical items	Office space	Warehouse space	Power and energy consumption	Network data communication
○	○				○	

Teleworking

Solution

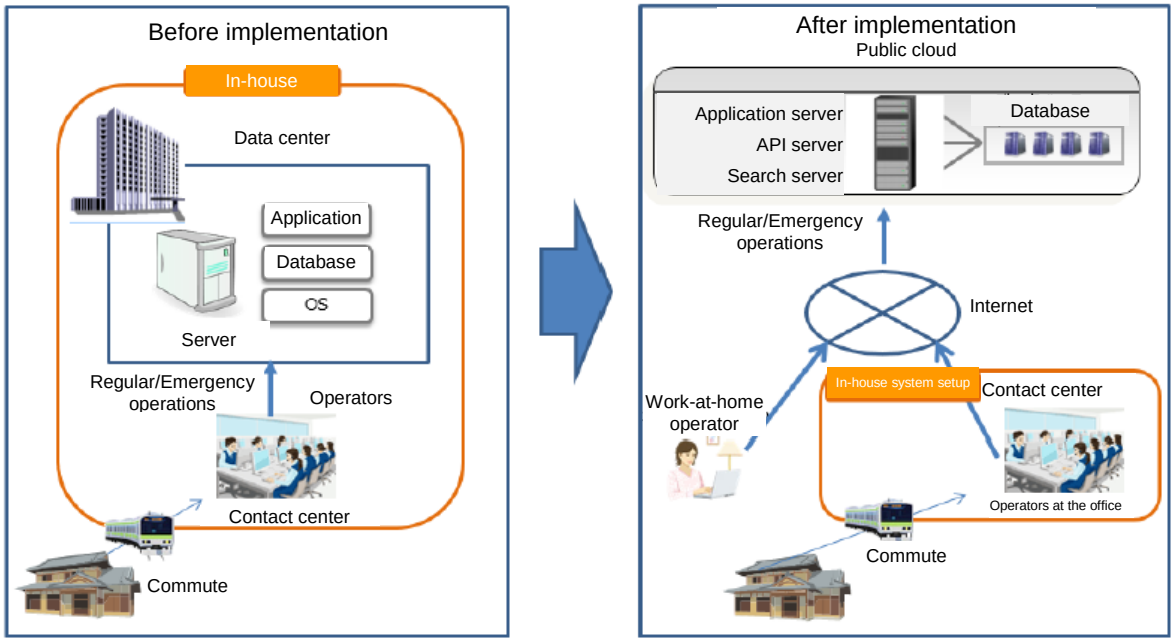
A1.7 Teleworking

Overview:

- Cloud-based call center is used in a teleworking setting.
- Enables call center support by operators working out of their homes, and provides operators different working arrangements.

Representative solution configuration and its CO2 emissions suppression effects:

Operators access the server from their particular location to carry out call center tasks. This reduces energy consumption for commuting, and suppresses CO2 emissions.



CO2 emissions suppression effects

Consumption of physical items	Movement of people	Movement of physical items	Office space	Warehouse space	Power and energy consumption	Network data communication
	○					

TV conferencing (remote conferencing)

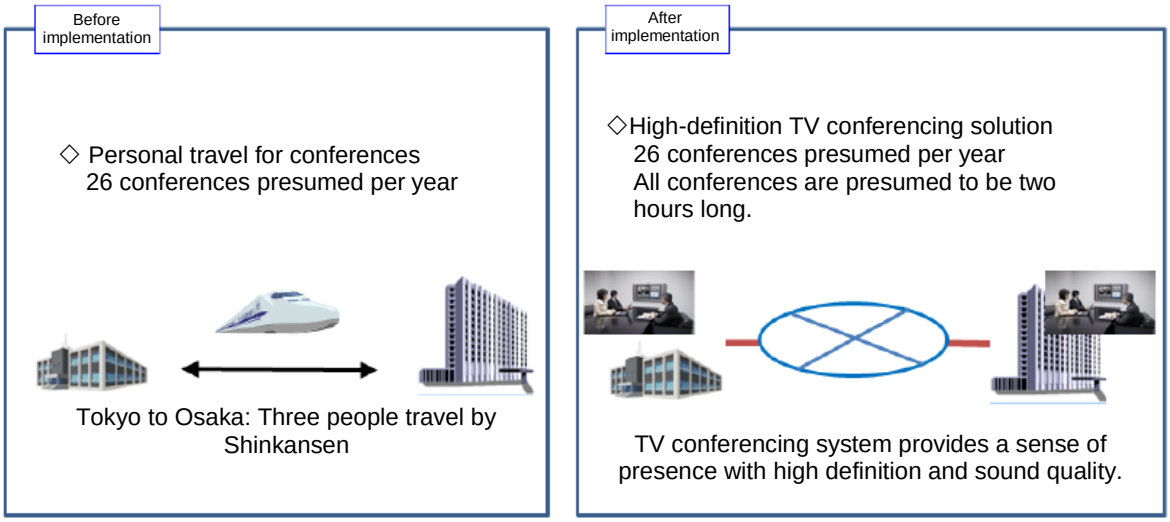
Solution

A1.8 TV conferencing (regular definition)

Overview:

TV conferencing solutions enable users in remote locations to hold conferences on video monitors. The effects of these solutions were calculated as differences with average in-person conferences where people travel between two sites. The average conference was presumed to involve traveling by three individuals between two sites, one in Tokyo and one in Osaka, at a frequency of roughly once a week and a duration of roughly one hour.

Representative solution configuration and its CO2 emissions suppression effects:



CO2 emissions suppression effects

Consumption of physical items	Movement of people	Movement of physical items	Office space	Warehouse space	Power and energy consumption	Network data communication
	○				○	

TV conferencing (remote conferencing)

Solution

A1.9 TV conferencing (regular definition)

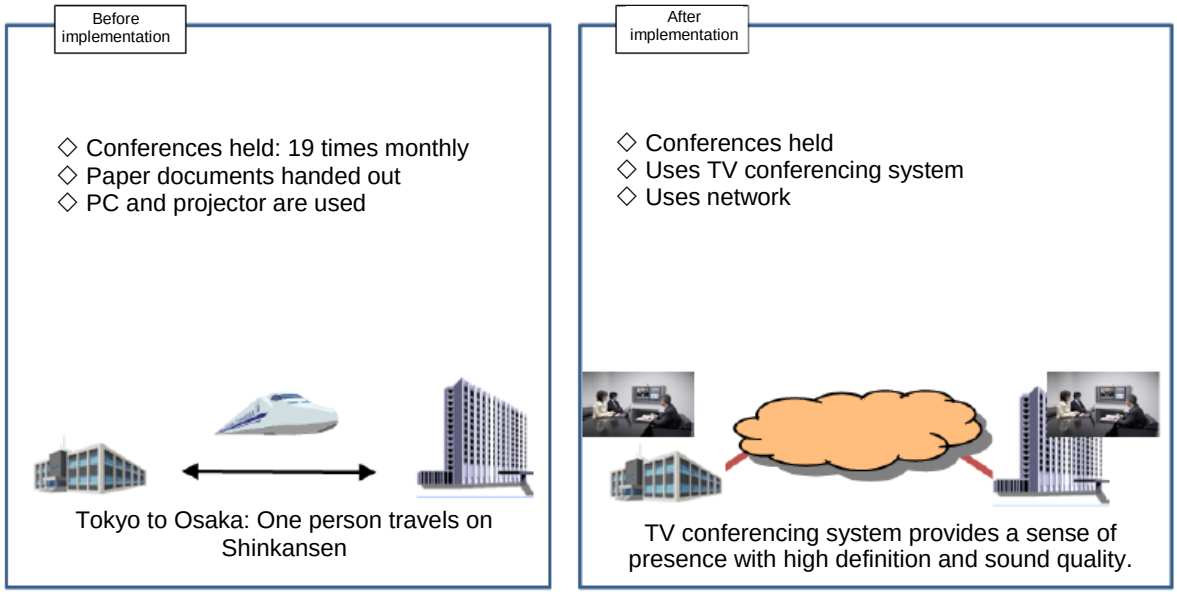
Overview:

- Conferences attended by participants in remote locations. High definition and sound quality available.
- Enables reductions in travel expenses and time.

Representative solution configuration and its CO2 emissions suppression effects:

Reduces the consumption of energy for personal travel by conference participants, and suppresses CO2 emissions.

Digitalization enables reductions in the number of paper documents.



CO2 emissions suppression effects

Consumption of physical items	Movement of people	Movement of physical items	Office space	Warehouse space	Power and energy consumption	Network data communication
○	○					

Remote medicine, electronic medical records

Solution

A1.10 Remote consultation

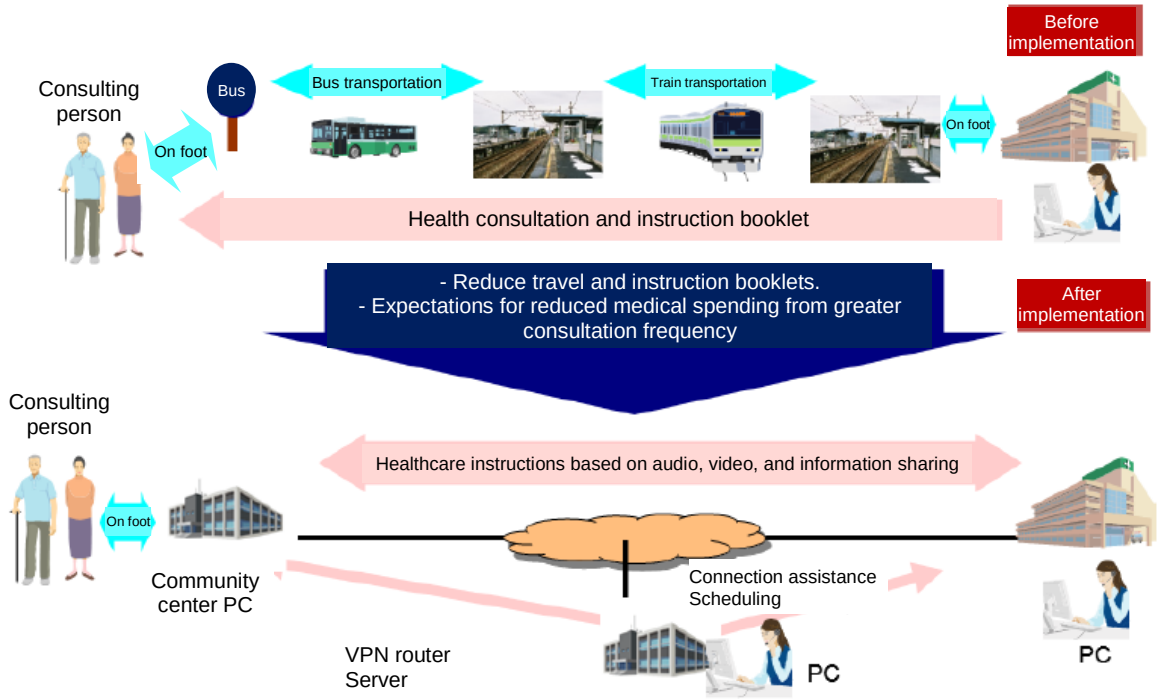
Overview:

- Receive health consultation at remote locations.
- Reduce the effort and costs involved with making doctor visits.

Representative solution configuration and its CO2 emissions suppression effects:

Consultations are carried out by connecting a PC installed at a public location, such as a community center, with a healthcare consultant's PC.

This reduces the energy consumed for travel by the consulting person, suppressing CO2 emissions.



CO2 emissions suppression effects

Consumption of physical items	Movement of people	Movement of physical items	Office space	Warehouse space	Power and energy consumption	Network data communication
	○					

Electronic procurement

Solution

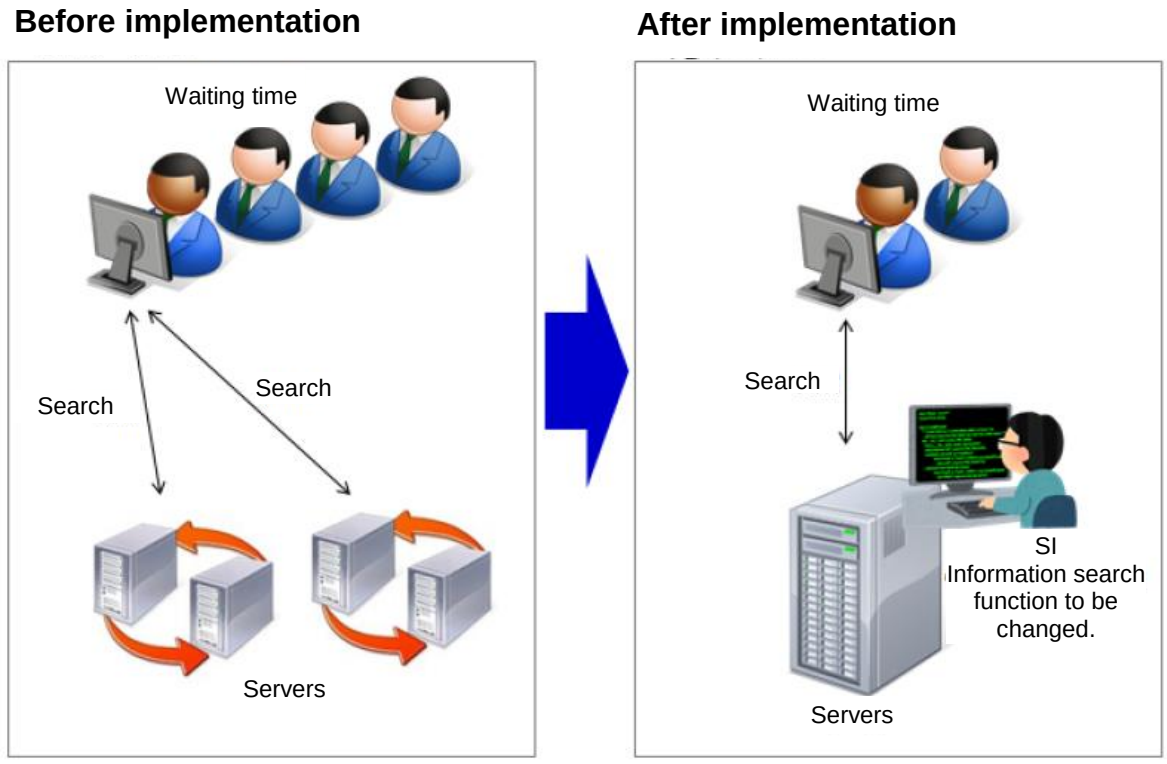
A1.11 Central management solution for administrative work

Overview:

Provide a system for centrally managing all administrative work, such as item procurement, in construction projects.

Representative solution configuration and its CO2 emissions suppression effects:

Reduces labor by connecting sub-systems seamlessly. Provides operability that helps reduce human errors when users operate the screen, improves the efficiency of related administrative work, and contributes to the suppression of CO2 emissions.



CO2 emissions suppression effects

Consumption of physical items	Movement of people	Movement of physical items	Office space	Warehouse space	Power and energy consumption	Network data communication
○			○	○	○	

Electronic publishing, electronic applications

Solution

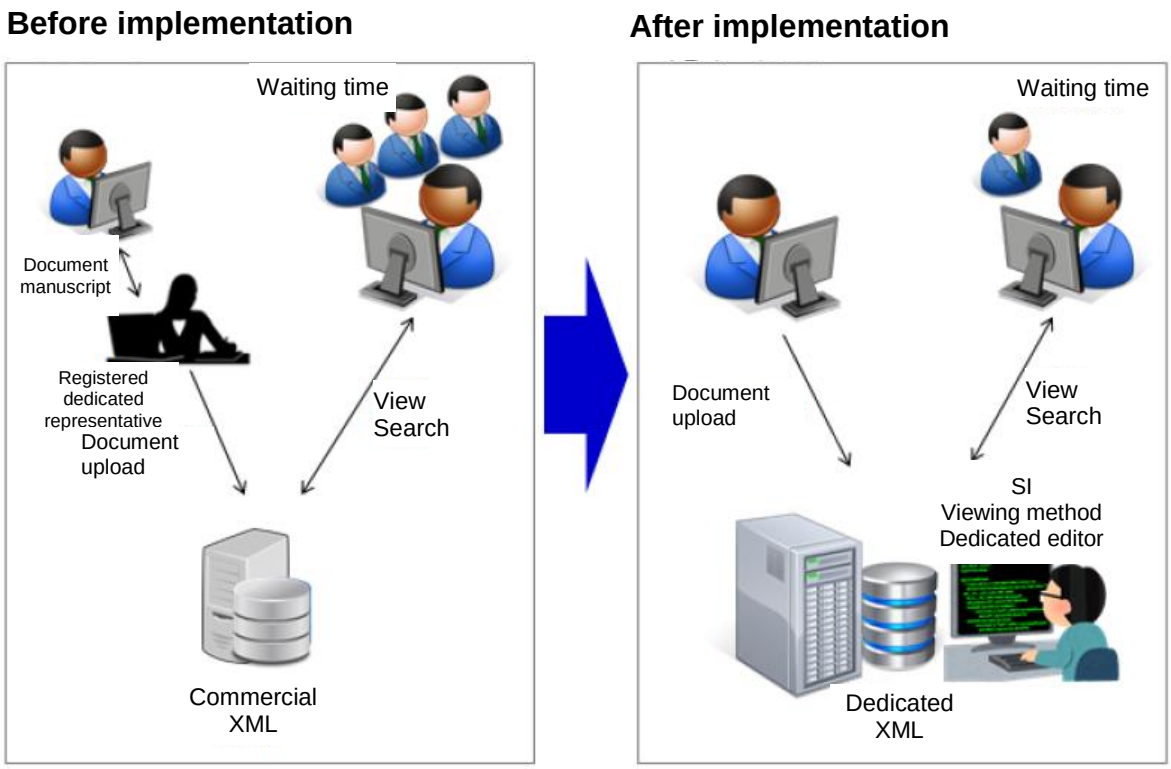
A1.12 Solution for managing administrative rules

Overview:

Solution for managing operational risks that may occur in a company's business activities.

Representative solution configuration and its CO2 emissions suppression effects:

Reduces paper use, time, and personnel required for managing administrative rules for administrative quality analyses, efficiency improvements and risk management, and contributes to the suppression of CO2 emissions.



CO2 emissions suppression effects

Consumption of physical items	Movement of people	Movement of physical items	Office space	Warehouse space	Power and energy consumption	Network data communication
○			○		○	

Eco-driving

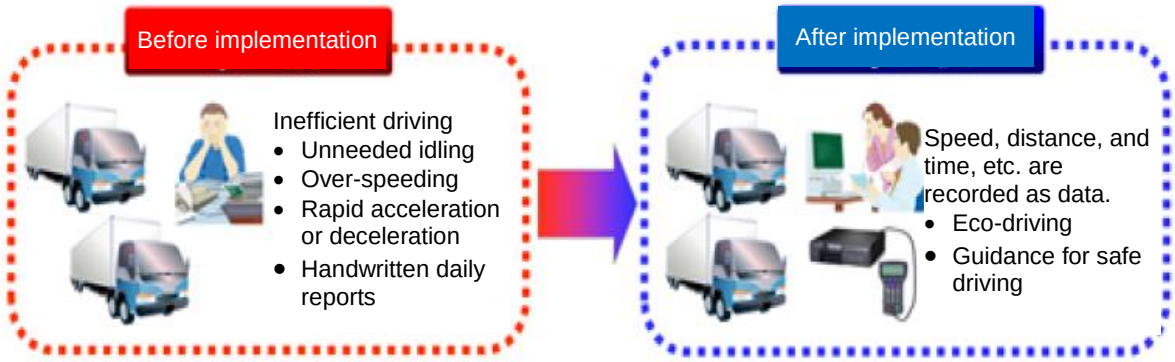
Solution

A1.13 Digital tachograph

Overview:

This system is installed on trucks and other vehicles to log driving records such as speed, distance, and time, which are then fed back to the driver and operations manager. Implementation of this system can help drivers avoid inefficient modes of driving, such as unneeded idling, over-speeding, and rapid acceleration or deceleration, to achieve eco-driving and improve fuel efficiency. Additionally, paper use and man-hours can be reduced as daily and monthly reports, which were previously handwritten, are recorded electronically.

Representative solution configuration and its CO2 emissions suppression effects:



CO2 emissions suppression effects

Consumption of physical items	Movement of people	Movement of physical items	Office space	Warehouse space	Power and energy consumption	Network data communication
○	○				○	

Tape storage

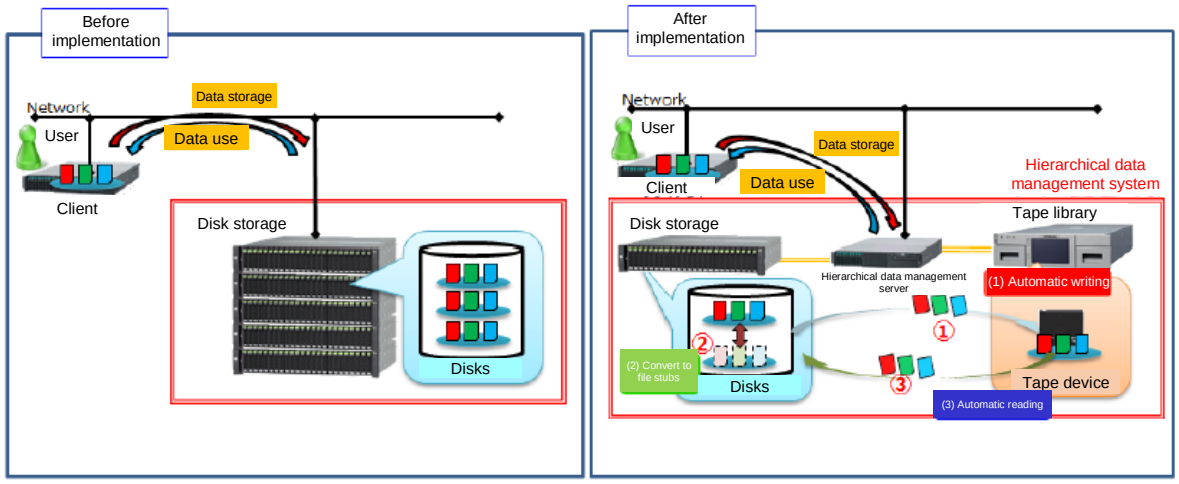
Solution

A1.14 Tape storage system

Overview:

With the increase in the amount of data in storage, the volume of archival data that is accessed only very occasionally continues to increase. This system automatically transfers data from hard disk drives to tape storage depending on their access frequency, and automatically reads the data from tape when it is needed.

Representative solution configuration and its CO2 emissions suppression effects:



The representative size of the solution in a storage system at a single site to apply the archival data tape storage was presumed to be 400TB.

CO2 emissions suppression effects

Consumption of physical items	Movement of people	Movement of physical items	Office space	Warehouse space	Power and energy consumption	Network data communication
					○	

A2. Basic calculation method for the effects of Green by IT

The following is an overview of the "Energy-Saving Contributions for Society at Large from IT Solutions Explanatory Booklet" (Green IT Promotion Council, Feb. 2013)

A2.1 Overview

The amount of CO2 emissions suppression from IT solutions can be calculated by summing up a number of components (Table A2-1). Individual CO2 emissions suppression amounts can be evaluated based on the differences in CO2 emissions in a particular field before and after IT solution implementation.

Table A2-1: Components of the effects of IT solutions, and formulae for their calculation (re-listed from above)

Components	Component subjects	Component calculation formulae
(1) Consumption of material	Paper, CDs, books, etc.	Reduction in consumption of material x Primary unit of consumption of material
(2) Amount traveled by persons	Aircraft, automobiles, trains, etc.	Reduction in personal travel distance x Primary unit of travel
(3) Amount traveled by items	Trucks, railroad, cargo, etc.	Reduction in item travel distance x Primary unit of travel
(4) Office space	Space occupied by persons (including work efficiency), space occupied by IT equipment, etc.	Space reduction x Primary unit of energy consumption per space ** Space reduction equals the number of persons reduced multiplied by the space occupied per person, or the number of pieces of equipment reduced multiplied by the space occupied per piece of equipment.*
(5) Warehouse space	Warehouses, refrigerated warehouses, etc.	Space reduction x Primary unit of energy consumption per space
(6) Electricity and energy consumption (IT and network equipment)	Power consumed by servers, PCs, etc.	Amount of change in power consumption x Primary unit of grid power ** This applies when converting electrical power into CO2 emissions.* ** This represents the amount of energy consumed from the use of IT equipment, and does not include energy consumed for the manufacture or disposal of such equipment.*
(7) Network data communication volume	Network data communication volume	Amount of change in data communication volume x Primary unit associated with data communication ** The amount of energy consumed for network communications includes energy consumed for Internet communications, but not intranet communications.*
(8) Other	Activities other than the above	Amount of change in activity x Primary unit of the amount of change

In the area of teleworking, for example, energy consumed for personal travel is reduced when the amount of travel by office staff (people) is reduced. Additionally, the number of staff working in the office is reduced by the implementation of teleworking, which in turn can be expected to have an effect on reducing office space. Therefore, the amount of energy reduced is the sum of components such as the effects from reduced personal travel (component 1), and that from reduced office space (component 2). Conversely, there is concern for greater electrical power consumption from working at home from the use of items such as appliances, IT equipment, and network (component 3). Therefore, the overall energy-saving effects of teleworking can be evaluated as (component 1) + (component 2) - (component 3).
"Office space" in this context covers the energy consumption reduction effect (energy used for lighting, air-conditioning, etc.) that results from less hours that the office and other facilities are used, which in turn is a result of improvements to work efficiency enabled by the implementation (or use) of the IT solution.
The effects of IT solutions can be expressed in terms of the energy consumed for personal travel, transport/consumption of physical items, and space (offices and warehouses), in combination with energy consumed by IT equipment and network communications. Individual effects can be calculated by multiplying the difference in activity quantities (amount of travel, consumption, etc.) by the primary unit for CO2 emissions per unit amount.

A2.2 Procedures for calculating energy conservation (CO2 emissions reductions) enabled by IT solutions

Calculations for energy consumption reduction effects enabled by IT solutions are made according to the flow shown in Fig. A2-1.

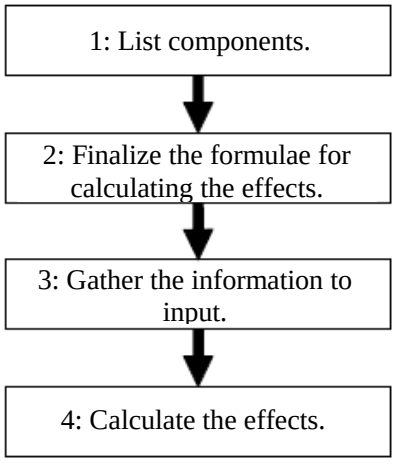


Fig. A2-1 Flow of calculations for the energy consumption reduction effects of IT solutions

(1) List components
First, clearly define the pre- and post-implementation states (scenarios).
Next, ascertain which of the components listed in Table A2-1 relate to the effects of IT solution implementation. Specifically, identify components where differences will arise before and after implementation*.

* If the differences before and after implementation are not obvious, you may calculate the CO2 emissions before and after implementation, and then calculate the differences.

In doing so, you must list all components that either result in a greater or smaller energy consumption for the whole (society at large) before and after implementation of the IT solution.
The following points must be taken into account in doing so.

- Take into account increases in energy consumption from IT equipment or information communication infrastructures (negative effects), and not only the effects that achieve reductions in energy consumption (positive effects). While power consumption by IT equipment generally tends to increase with the implementation of IT solutions, it may also decrease, such as when servers are integrated.
- While the overall form, including IT solution implementation, will be different before and after implementation, compare the scenarios that provide the same functionality (interchangeable scenarios).

(2) Finalizing the formulae for calculating the effects
Next, finalize the formulae for calculating the CO2 emissions (or emissions suppression amounts) (in kg-CO2 or other unit) for each component listed. In doing so, use the component calculation formulae shown in Table A2-1, and develop them based on the availability of data to arrive at the actual formulae. Generally, make sure that the formulae produce CO2 emissions values for a one-year period (calculation coverage period).
Whether or not the data to be pre-input can be gathered must be taken into account when finalizing the formulae.

(3) Gathering the information to input
Once you have finalized the formulae for calculating the components, gather the data to input into these formulae. There are two types of information that will be needed for evaluating the energy-saving effects of IT solution implementation.

(i) Activity quantity
This refers to the amount of change in energy and resource usage from utilizing the IT solution. For example, reductions in private car fuel consumption from eliminating commutes can be included for teleworking, and reductions in the consumption of paper and other items can be included for paperless offices.

(ii) Primary unit information
This refers to the value that is used to convert the changes in energy consumption that result from utilizing IT solutions into amounts of CO2. In teleworking, this will be the amount of CO2 reduced from reductions in private car fuel consumption as a result of commutes being eliminated, and, in a paperless office, the amount of CO2 that is emitted in the production of a per-unit weight of paper that is not consumed.

In some cases, where data cannot be directly acquired or measured, simplified calculations of CO2 emissions suppression amounts are made by applying averages, representative values, or other referential values to (i) and (ii).

Additionally, the following points must be taken into account when selecting a primary unit.

- It is preferable to use a common primary unit (or primary units that vary to only a limited degree) when comparing the CO2 emissions suppression amounts of different IT solutions.
- Some primary unit values may be subject to updates (e.g., CO2 emissions coefficient for grid power). When using such primary units, it is preferable to select the appropriate primary unit by taking into account the point in time for which you seek to calculate the effects, as well as the purpose for which the calculation results will be used.

For example, when comparing changes in the effects of the same solution over time, steps such as using specific primary units for different points in time will be needed.

(4) Calculating the effects

Based on the information gathered, calculate the effects of each of the components according to the formulae that were finalized in step (2). Then, calculate the sum of all effects, paying close attention to the values' signs.