



Giesecke+Devrient
Creating Confidence

Cash Cycle Standardization and Optimization

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1. Management Summary

The pressure on cash is growing as a result of external effects, such as developments within the payment markets and the pandemic crisis. One topic that addresses the aforementioned points is standardization. Higher standardization throughout the cash cycle will reduce the cost of cash, increase the cash cycle performance, and keep cash competitive against other means of payments.

This study takes a closer look at the standardization of transport units in the cash cycle, as they directly determine the level of automation, the efficiency of banknote transportation, the optimized use of storage space, investments, and the effect on environmental sustainability.

To optimize the cost of cash via transport units, four different scenarios of standardized cash cycles have been developed. The referenced transport units fit best to the individual requirements of the different players in the cash cycle.

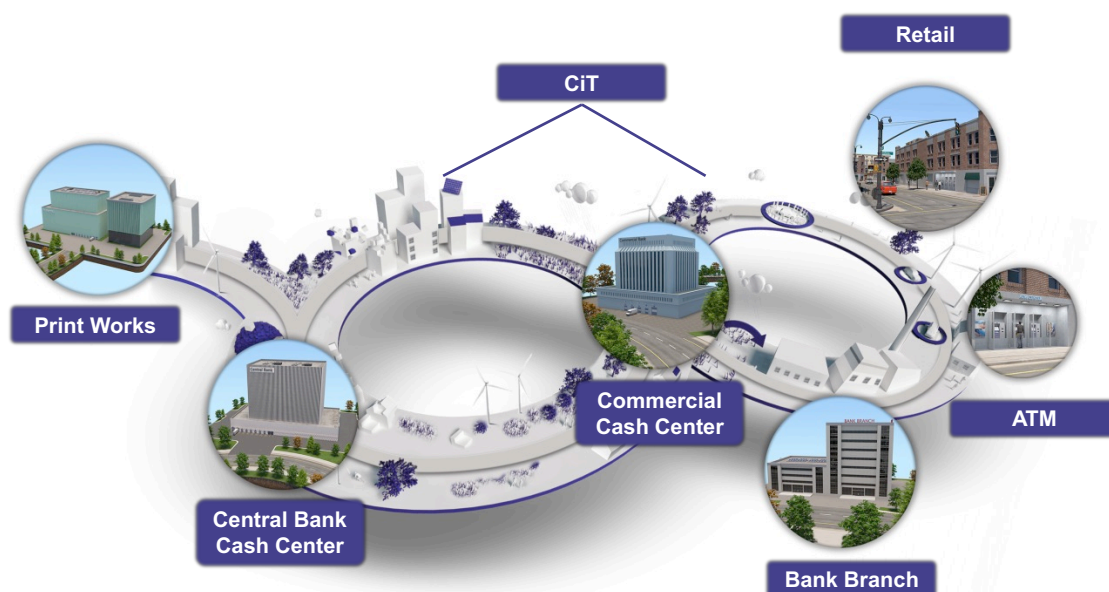
The transport units identified are cardboard boxes and stackable plastic boxes for banknote bundles and packets. For loose banknotes, banknote trays such as NotaTracc® Trays and safebags/ATM cassettes have been identified.

Besides current requirements on transport units, environmental sustainability will gain in importance in the near future. G+D is already in discussions with large cash cycle players concerning the reduction of packaging waste, the use of reusable transport units, and how to deal with regulatory plastic bans.

The results of this study demonstrate that the overall best cash cycle scenario for a country always depends on the conditions of the respective market, e.g., the distribution of the various tasks, the local network of cash centers, the banknote volumes. What applies in all situations: If the cash cycle players work together on an overall solution for their individual cash cycle, the cost of cash will be reduced, and the players can reap the benefits of standardization.

2. Initial situation

Across the majority of the world, today's cash cycles can be described in a figure of an eight. The freshly printed banknotes come from a printworks facility and are distributed by the central bank into the commercial market. In the commercial market players like CiTs (Cash in Transit companies) or commercial banks ensure a working cash cycle via bank branches, ATMs, or points of sales.

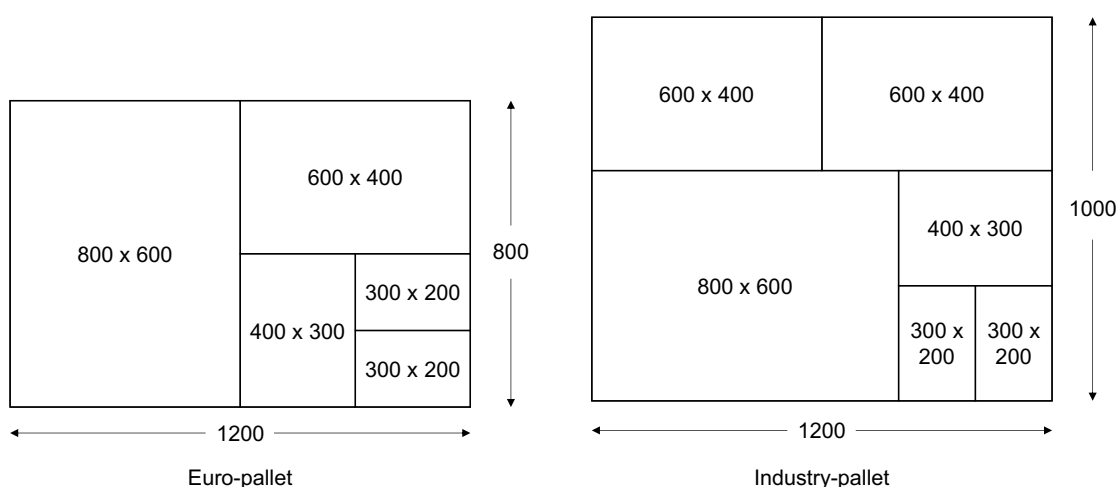


The pressure on cash is growing due to external effects, such as developments within the payment markets and the pandemic crisis. The cost of cash and the cash cycle performance are gaining in importance. Additionally, the environmental pressure on the cash cycle is increasing. One topic that addresses the aforementioned points is standardization. Higher standardization throughout the cash cycle will reduce the cost of cash, as well as the carbon footprint, increase the cash cycle performance and keep cash competitive against other means of payments.

Herewith, the standardization of transport units is a key element that should be addressed to maximize the efficiency of banknote transportation in the cash cycle across the borders of different players. Currently, most cash cycle players use their own transport units. There is hardly any standardization within a specific cash cycle, let alone globally. Furthermore, standardization enables the use of automated machinery and equipment. In many other industries, such as the automotive, food or pharmaceutical industries, the standardization of transport units has become indispensable, as it has led to great efficiency, growth, and a reduction of the carbon footprint. Another major advantage of standardized transport units is the possibility of

track and trace. Through (automated) scanning of the transport units, it is always possible to track where banknotes are at any given time. With the help of this data, further optimization of the processes can then take place.

In the world of logistics, standardized measurements have become the norm. These allow efficient storage, internal and external transport (e. g. conveyors, forklifts, AGVs, trucks, etc.), as well as automated production. As can be seen in the following images, the used formats, which are based on euro or industry pallets, can be seamlessly combined with one another and allow the best possible use of space. This results in a high storage density, high utilization of space inside the means of transport, and as such, a reduction of carbon footprint.



In the world of banknote transport units however, there is currently barely any standardization: All over the world, the same players (with slightly different tasks) process the same product (banknotes) with the same basic processes. However, there is an enormous variety of transport units in place. The aim of this study is to develop scenarios that enable standardization within the cash cycle, show cash cycle players the potential for optimization, and thus strengthen cash in the payment area.

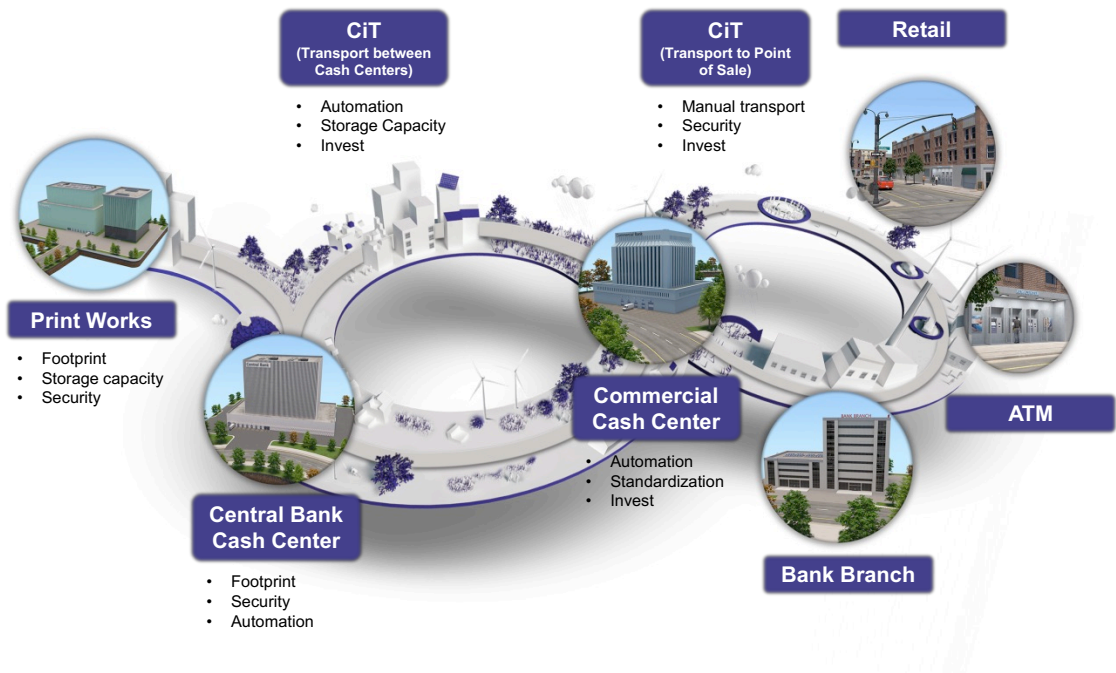
To do this, the cash cycles of various markets on different continents were examined with the aim of developing possible future scenarios with standardized transport units. In a second step, the detailed processes were reviewed, and the transport units in use at which positions in the cash cycle were investigated. A quantitative and qualitative evaluation of already existing transport units was performed. For both evaluations global interviews were conducted to rank every transport unit according to the identified quantitative and qualitative criteria. In the following chapter the used criteria are described, followed by a description of the newly developed scenarios in the next chapter.



2.1 Individual requirements in the cash cycle

Global interviews showed that each cash cycle player has its own key criteria of transport units. For instance, printworks noted that storage density is of utmost importance because large quantities of banknotes need to be stored. For a commercial cash center, storage density is less important, as usually, the smallest possible quantities are stored. For them, the amount of the necessary initial investment is a more important criterion.

The results of the conducted interviews for all players can be seen in the following image:



In addition to the above-mentioned criteria, we see **environmental sustainability** as one further criterion that will gain in importance for all cash cycle players in the future. These might include the utilization of reusable containers, the reduction of empty transport, the reduction of waste with less need for packaging, or choosing a reusable solution for plastic safebags. All of these aspects depend directly on the used transport unit.

2.2 Best fit transport units

Based on the key criteria outlined above for the individual players and for the overall cash cycle, the following transport units have been identified as most suitable:

Transport units for handling of banknote bundles or packets:

- **Cardboard boxes**, standardized/stackable
- **Plastic boxes**, standardized/stackable, volume max. 10,000 banknotes

Transport units for handling of loose banknotes:

- **Banknote trays (e. g. NotaTracc Trays)**, volume max. 3,000 banknotes
- **Safebags** (often combined with canvas bags), volume (usually) max. 3,000 banknotes for the future: **Reusable, optimized safebags**
- **ATM cassettes** (for filling ATMs, common capacity 2,000 banknotes)

With the above-mentioned transport units, the following scenarios were developed as ideal blueprints. Every country will bring a pre-set of current transport units with them. Frequently, it seems impossible to change these pre-conditions. With this paper we want to arouse an interest in alternative solutions and invite all cash cycle players to start with from scratch and design the ideal best-case scenario. In a second step, specific existing transport units can be integrated in those scenarios. These are our lessons learnt from a consulting approach towards our customers.

3. Scenarios

The analysis brought up four different scenarios:

1. **Intelligent automation**
2. **High sustainability**
3. **High transport volume**
4. **High storage capacity**

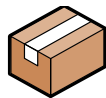
The rating of the scenarios was performed according to their automation possibilities, storage capacity, and environmental sustainability.

- ★★★ Completely fulfilled
- ★★☆ Partly fulfilled
- ★☆☆ Hardly fulfilled

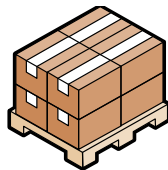
Process steps that can be automated in the future are marked with the following icon:



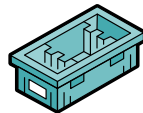
The following transport units are used for the scenarios:



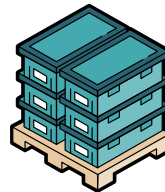
Cardboard box



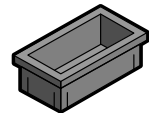
Cardboard box stack



NotaTracc Tray



NotaTracc Tray stack



Banknote Tray



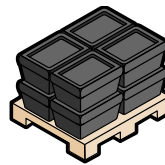
Reusable Safebag



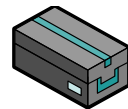
Safebag



Plastic box

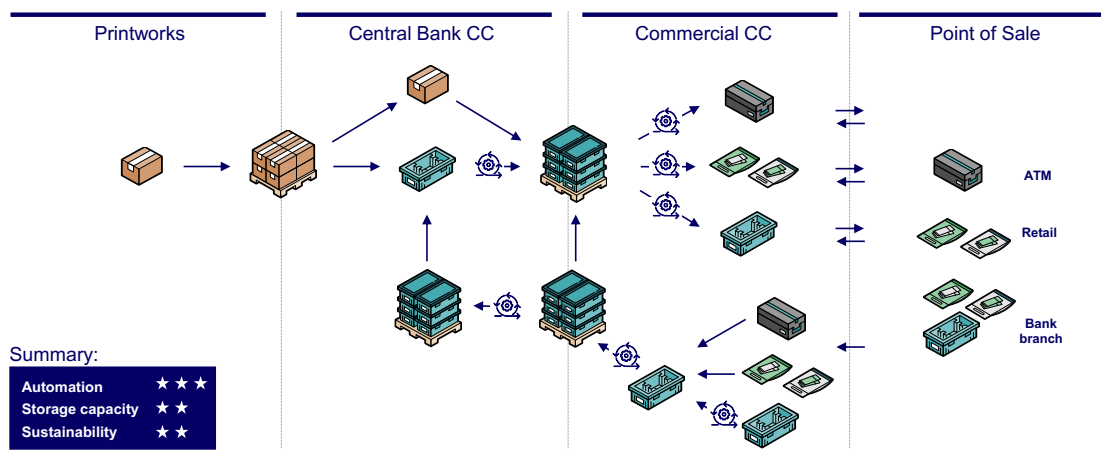


Plastic box stack



ATM cassette

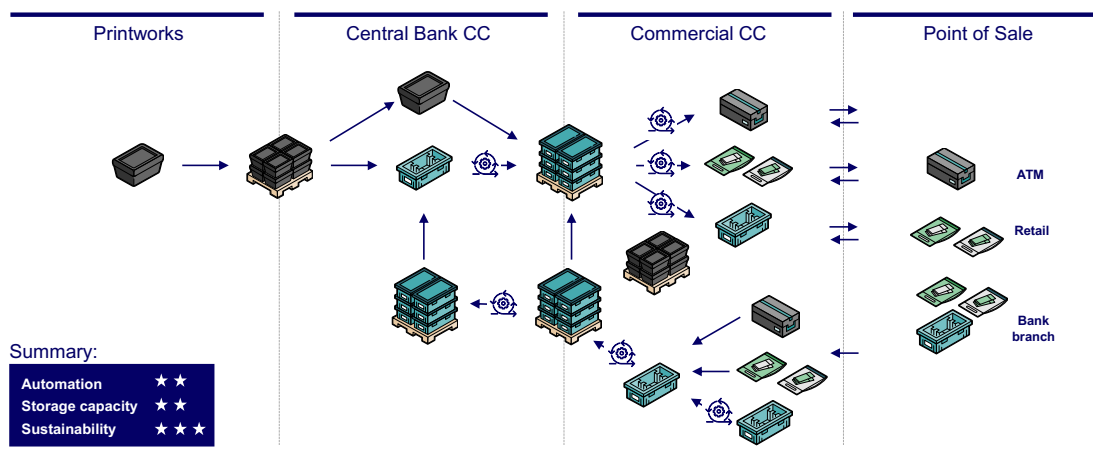
3.1 Intelligent automation scenario



The **first scenario** describes the usage of cardboard boxes for storage at the printworks and for transportation to central bank cash centers. Within central bank cash centers, NotaTracc Trays are used for banknote processing. For the transportation between the central bank and commercial cash centers, either NotaTracc Trays or cardboard boxes (for delivery of new banknotes) are used. From commercial cash centers three different units are used (where required): ATM cassettes, safebags, and the NotaTracc Trays for larger volume transportations. These transport units are also used to transport the banknotes back from retail, ATMs and bank branches. The commercial cash centers then use NotaTracc Trays for their efficient sorting processes. As such, ATM cassettes and safebags are repacked into the trays. After processing, the NotaTracc Trays are transported to the central bank cash center where the trays will either go back into the cash cycle or the banknotes are destroyed.

The first scenario's main **advantage** is the increase in efficiency, mainly through the increase of intelligent automation. Automated banknote loading into the Banknote Processing System (BPS) is already possible (via the NotaTracc Loading Module). Additionally, a holistic automation portfolio surrounding the NotaTracc Trays is currently under development. It includes automatic reject handling, automatic fit/unfit sorting into NotaTracc Trays, as well as modules for sorting banknotes from NotaTracc Trays into a box, ATM cassette, or another NotaTracc Tray (TrayFilling, Tray2ATM, etc.). As such, processing and transport with no hands-on cash is in view. This also means a significant reduction in repacking processes. NotaTracc Trays also make a difference in semi-automated processes: The manual filling of ATM cassettes out of trays with loose banknotes and a pre-set amount of banknotes (e.g. 3,000 banknotes per tray) is much faster than traditional repacking processes. Besides these advantages, scenario one also scores well with regard to sustainability: Due to the transport of loose banknotes, a great reduction of packaging waste for banknote storage and transport is possible.

3.2 High sustainability scenario

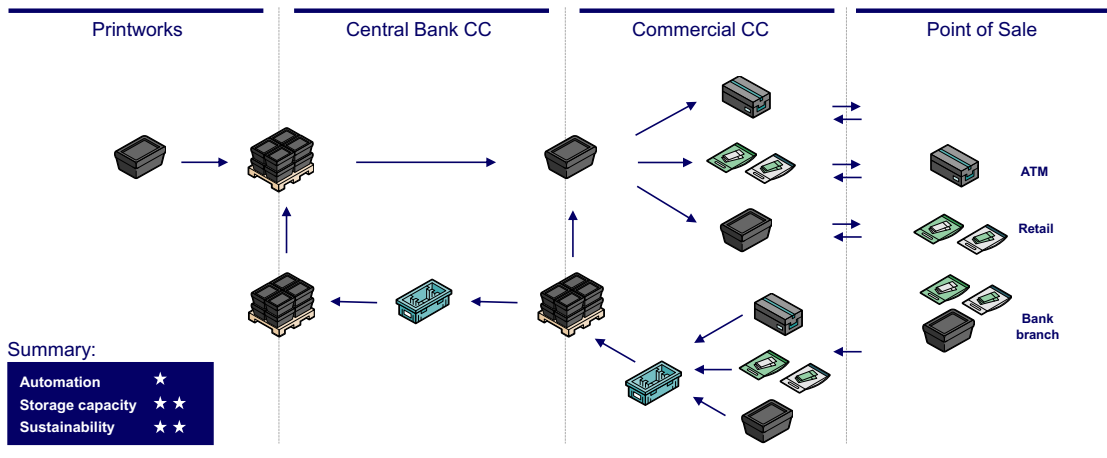


The **second scenario** describes the usage of plastic boxes for storage at the Printworks as well as for transport to central bank cash centers. Within central bank cash centers, banknote trays are used for banknote processing. For the transportation between the central bank and commercial cash centers, either banknote trays or the above-mentioned larger volume plastic boxes (for delivery of new banknotes) are used. The transport to and from the point of sale is similar to Scenario One via ATM cassettes, safebags, and banknote trays. Following the processing in the commercial cash centers, the banknote trays are transported to the central bank cash center where the trays will either go back into the cash cycle or the banknotes are destroyed.

The use of NotaTracc trays is not mandatory for this scenario, but any kind of banknote trays can facilitate the prepping, feeding and reconciliation. To benefit from the highest level of intelligent automation, the use of NotaTracc Trays is recommended.

The main **advantage** of this scenario is its sustainability, created by the reusability of all transport units and the exchange of these units between cash cycle players. Both the plastic boxes and the banknote trays can be reused. If the transport of the empty transport units is well organized and the distance between the players is small, the carbon footprint is low. Furthermore, the use of banknote trays with loose banknotes decreases the amount of packaging waste significantly.

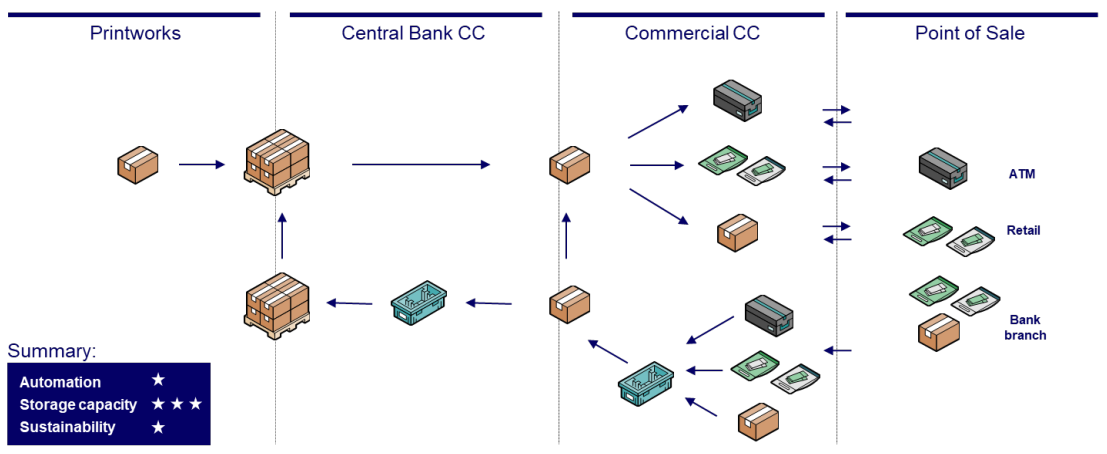
3.3 High transport volume scenario



The **third scenario** is very similar to the second one. In this scenario, however, banknote trays with loose banknotes are not circulating between the different players but are used for optimized banknote processing within the cash centers. For transport between the players, standardized, high volume plastic boxes are used. As in Scenario Two, the use of NotaTracc Trays is not mandatory but is recommended for higher automation possibilities.

The general **advantage** of this scenario lies in the higher storage capacity of transport units between the cash cycle players due to larger plastic boxes. However, this also leads to more repacking processes and a higher number of transport units in the field. Additionally, more packaging waste reduces the scores in sustainability.

3.4 High storage capacity scenario



The **fourth scenario** describes the usage of cardboard boxes throughout a major part of the cash cycle. Cardboard boxes are used for storage at the printworks as well as for transport and storage in the central bank cash centers. Inside the central bank cash centers, these cardboard boxes are also used to prepare orders for the

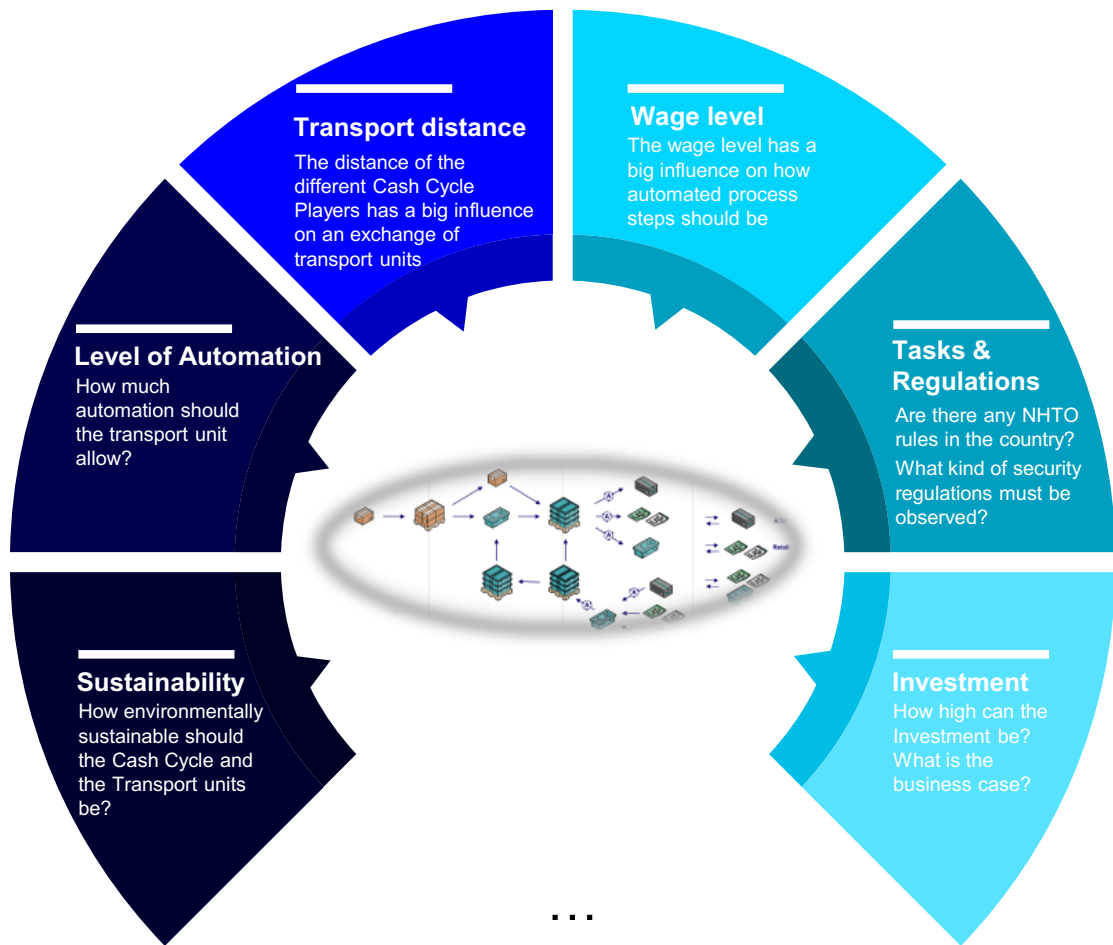
commercial cash centers. The transportation and processing in commercial cash centers and to point of sales is similar to Scenarios Two and Three, with the only difference being that cardboard boxes can be used for large volume transports.

The main **advantage** of this scenario is the high storage density of the cardboard boxes. This leads to an optimization of the vault space at the different players as well as an efficient high-volume transport. On the other hand, a lot of time-consuming repacking processes are done. In addition, with cardboard boxes and packaged banknotes, a lot of single-use packaging is needed, which leads to a large consumption of resources.

3.5 Conclusion

	Automation	Storage Capacity	Environmental Sustainability
Intelligent automation	★ ★ ★	★ ★	★ ★
High sustainability	★ ★	★ ★	★ ★ ★
High transport volume	★	★ ★	★ ★
High storage capacity	★	★ ★ ★	★

When comparing the different scenarios with each other, it is clear that there is no scenario that scores highly across all categories. There is always a tradeoff between the different criteria. The individual ideal scenario for a cash cycle depends on the conditions within the respective market. We were able to identify the following major influencing factors for a cash cycle's ideal scenario.



A possible use case is a country where the distance between the players is rather small, and sustainability plays a major role. Here, the exchange of standardized transport units with loose banknotes benefits all players and makes cash handling as efficient as possible. In this example Scenario One (NotaTracc Tray scenario) or Scenario Two (Plastic Box with NotaTracc Tray exchange) would be a beneficial option.

When it comes to a country that is scattered over many islands, Scenario Four (cardboard box with intralogistics banknote trays) could be an ideal scenario to lower transportation costs with one-time cardboard boxes and benefit from automation possibilities with NotaTracc Trays inside the cash centers.

4. Implementation and next steps

In order to implement one of the scenarios shown in this study and to create an optimized cash cycle with standardized transport units, a variety of steps need to be implemented.

Firstly, the existing cash cycle must be analyzed. This involves looking at all cash cycle players and the distribution of the various tasks, the local network of cash centers, banknote volumes etc. A vision of the future cash cycle will help steer it on its path. Then, possible future scenarios can be derived. It is of elementary importance that all stakeholders are involved in this process. Once there is an agreement on a scenario, it makes sense to carry out a test run. For this test, selected players are supplied with the standardized transport units and the different processes can be executed on a small scale. After the test phase, there should be an evaluation and a review and, if necessary, an adjustment of the scenario. Once this has been carried out, a market-wide rollout can take place and the players can reap the benefits of a standardized cash cycle.

We are happy to support you in planning or executing projects to help you optimize the cash cycle for your individual needs and demands. Contact us and we'll connect you with the experts.

About Giesecke+Devrient

Giesecke+Devrient (G+D) is a global security technology group headquartered in Munich. As a partner to organizations with highest demands, G+D engineers trust and secures essential values with its solutions. The company's innovative technology protects physical and digital payments, the connectivity of people and machines, the identity of people and objects, as well as digital infrastructures and confidential data.

G+D was founded in 1852. In the fiscal year 2020, the company generated a turnover of 2.31 billion euros with around 11,500 employees. G+D is represented by 74 subsidiaries and joint ventures in 32 countries. Further information: www.gi-de.com.

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More insights



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