

Zurich University of Applied Sciences (ZHAW)
School of Management and Law
Department of Banking, Finance, Insurance
Bachelor of Science in Business Administration
Banking and Finance
2012 – 2016

Bachelor Thesis
FS 2016

Analysis of the significance of banks' presentations of results

An intercontinental comparison of leading Asian, North American and European financial institutes.

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Submitted on: 26 May 2016

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MANAGEMENT SUMMARY

Data visualisation has a long history and is nowadays used in various areas, yet is not taught at any school or university. While technicians, musicians and cartographers have been successful in standardising the display of information over the last centuries, this hardly applies to business administration. There has been little research on the visual editing of charts and tables to date; generally accepted standards are scarce. Recent independent studies have shown that the annual reports of selected companies from German-speaking countries presented issues with the visualisation of both charts and tables.

Following the aforementioned studies, the aim of the present paper was to analyse the efficiency and effectiveness of the leading five banks in Asia, North America and Europe in terms of presenting earnings results, focussing on visualising charts and tables in their respective results presentations. Furthermore, the present analysis aimed at assessing whether there were differences in efficiency and effectiveness or, more generally, approaches to presenting results and visualising data in earnings presentations of banks from Western countries and Eastern countries.

In this context, the results presentations of the sample banks were analysed in terms of six distinct criteria groups:

- ISO norms
- Other format suggestions
- Charts
- Tables
- Colour coding
- Linguistic aspects

For each criterion and criteria groups, scores were assigned to the individual banks, which enabled ranking by individual banks and by continents.

From the analysis, it emerged that European banks best met the analysed criteria, ranking first, with North American banks following closely and Asian banks ranking last.

When looking at individual banks, UBS scored the highest rating, while ABC (Agricultural Bank of China) is on the last rank. Overall, the Asian sub-sample revealed weaknesses in five out of six criteria groups. Major drawbacks were found to be low data densities and direct-labelling rates in charts and various distortions of information. With regard to tables, four out of five banks often adopted a reverse chronological order; issues were also located with the correct alignment of texts and figures. Lastly, readability was weak, with the presence of typing/orthographical errors. Nonetheless, North American and European banks were also found to be deficient in some areas including: use of pie charts, medium-low data densities in charts, medium direct-labelling rate, information distortions in 15% of all analysed charts, use of reverse chronological order in tables, inappropriate and inconsistent use of colours as well as terminology. In general, compliance with ISO norms was low across the sample.

The aforementioned low observance of ISO norms raised the question of how and to what extent ISO standards may enhance clarity and efficiency. Further studies accompanied by oculometric tests are suggested in order to explore this circumstance. Meanwhile, it is recommended that banks, above all, improve consistency in their own notation standards, terminology and use of colours as well as increase data density and refrain from distorting information in charts.

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1 Introduction

1.1 Background

In the recent past, capital markets have undergone considerable changes: on the one hand, the continuously growing financial industry has launched new products and services (e.g. securitisation); on the other hand, business models have become more complex, uncertainty and risk sources have augmented and risk management is handled with more elaboration (IFAC, 2011, p. 6). Concurrently, both data volume and the number of regulations to adhere to have notably increased, as has the companies' aspiration to fulfil everybody's wishes (Marty, 2015, p. 3). In response to this evolution, financial reporting requirements have had to adapt: there has been a transition to supplying more detailed documentation, which in turn renders it more difficult for the readers of such statements to quickly assess the importance of each piece of information (IFAC, 2011, p. 6). While charts and tables help readers quickly interpret data in the right way, there has been little research on the visual editing of charts and tables to date; generally accepted standards are scarce (Eisl & al., 2015, p. 5). In this regard, information design, defined by Horn (1999, as cited in Pettersson, 2002, p. 18) as "the art and science of preparing information so that it can be used by human beings with efficiency and effectiveness" may offer some help.

Besides providing information about the financial situation and outlook of a company, the primary function of financial communication is to convey a comprehensive and clear picture regarding the performance and prospects of success to the target groups (i.e. private and institutional investors, shareholders, analysts and business journalists) (Hillmann, 2011, p. 50 f.). Companies have recognised that they can improve both their competitive position and equity price by means of open and continuous communication (Hillmann, 2011, p. 49 ff.). Nevertheless, two separate studies (one conducted by the University of Applied Sciences Upper Austria (FH OÖ) and KPMG (Eisl & al., 2015) and another conducted by Griesfelder and Reinke (2013)) showed that the annual reports of selected companies listed on the DAX 30, the ATX and the SMI presented issues with the visualisation of both charts and tables – in some cases, for instance, facts were distorted by means of cut axes.

1.2 Aim and objectives / Research question

Despite the abovementioned lack of generally accepted and adopted standards, a set of basic guidelines has emerged, also thanks to recent eye-tracking tests. Thus, the aim of this paper is to analyse the efficiency and effectiveness of the leading five banks in Asia, North America and Europe in terms of presenting earnings results, with a focus on visualising charts and tables in their results presentations. In addition, the present survey aims at assessing whether there are differences in efficiency and effectiveness or, more generally, approaches to visualising data in results presentations of banks from Western countries and Eastern countries.

This paper is structured as follows: section [2 Theoretical framework](#) reviews the literature on which this study is based and offers an explanation of the [methodology](#) adopted as well as the [sample](#) of banks. Section [3 Results](#) presents the [findings](#) and the discussion thereof. Finally, section [4 Conclusion](#) sums up the findings, answers the research question and suggests [topics for future research](#), but also outlines [the limitations of this study](#).

2 Theoretical framework

Despite the study of this subject being in its early stages, a basic set of guidelines for the visualisation of both charts and tables does exist. These guidelines are explained in the following sections. Subsequently, the use of colours is discussed and this part of the present paper concludes with some considerations regarding barrier-free visualisations, readability and terminological consistency. To begin with, however, the notion of information visualisation and (business) information design is briefly introduced.

2.1 Literature Review

2.1.1 Information visualisation and (business) information design

Data visualisation has a history going back some 400 years and is nowadays used in various areas (e.g. analysis, reports, presentations), yet is not taught at any school or university (Griesfelder, 2014a, p. 66). Visualisation of data is a highly efficient form of communication and offers various advantages, the major one being that a large amount of information may be quickly interpreted, providing the data is displayed well (Ware,

2013, p. 3). Bearing this in mind, the question arises how information may best be converted into something that human beings can comprehend when it matters (Ware, 2013, p. 5).

Information design (hereinafter: *ID*) deals with exactly this question and encompasses "research on the principles for analysis, planning, presentation and understanding of messages – their contents, language and form" (Pettersson, 2002, p. 2). Since the 1950s, *ID* has been given various definitions; likewise, the term has also been utilised with a more aesthetic focus (Pettersson, 2002, p. 15 ff.). Nonetheless, the notion of *ID* that would also appear appropriate for a business context is the following:

"Information design is defined as the art and science of preparing information so that it can be used by human beings with efficiency and effectiveness."
(Horn, 1999; as cited in Pettersson 2002, p. 18).

In particular, business information design (hereinafter: *BID*) is concerned with data visualisation both according to technical aspects and in terms of perception psychology (Griesfelder, 2014b, p. 83). For both *ID* and *BID*, clarity of communication should always be the primary objective; other key notions include, inter alia, simplicity, precision, consistency and comprehensibility as well as legibility (Pettersson, 2002, p. 21). In fact, complex language will render it more difficult to comprehend a message (Pettersson, 2002, p. 21).

Over the last centuries, technicians, musicians and cartographers have been successful in standardising the display of information; nonetheless, this hardly applies to the areas of business administration and politics (Griesfelder, 2014a, p. 66). The following section therefore introduces the various types and functions of diagrams, discussing their advantages and disadvantages and reviewing relevant guidelines.

2.1.2 Charts and their categorisation

For the purpose of business information design, charts may be divided into three categories: vertical charts, horizontal charts and charts with two value axes (Griesfelder, 2014b, p. 83):

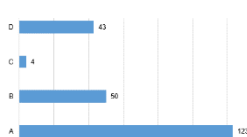
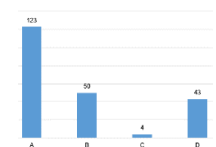
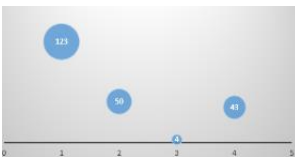
Chart category	Description/features	Example(s)
Vertical charts	<ul style="list-style-type: none"> ▪ have a vertical category axe ▪ run from top to bottom ▪ typically show structural data 	Single bar chart 
Horizontal charts	<ul style="list-style-type: none"> ▪ have a horizontal category axe ▪ run from left to right ▪ typically display time series 	Single column chart, line chart 
Charts with two value axes	<ul style="list-style-type: none"> ▪ have no category axes ▪ have two value axes ▪ use two-dimensional placing of visualisation elements 	Bubble (portfolio) chart 

Table 1: Chart categories (based on Griesfelder (2014b))

There is also a category of *other charts*, which includes charts that are less appropriate for business information design (e.g. pie charts, speedometers, traffic lights) and should therefore be avoided whenever possible (Hichert & Faisst, 2015, p. 49 ff.).

In the following passages, the most important charts pertaining to the abovementioned categories are presented. (The following list is not meant to be exhaustive.)

2.1.2.1 Single bar chart

Category	Vertical charts
Use(s)	Single bar charts are primarily suited for <i>structural analyses</i> . (based on Hichert & Faisst, 2015, p. 26)
Constituents (based on Hichert & Faisst, 2015, p. 27)	<ul style="list-style-type: none"> ▪ <i>Vertical category axis</i> (representing the relevant structure elements) ▪ <i>Bars</i> (extending from the category axis to their relevant values) ▪ <i>Legends</i> (In this particular case, the name of the data series (i.e. legend) is already a constituent of the chart title, given that there is merely one data series.) ▪ <i>Data labels</i> (Naming the values of the data series in accordance with the length of the relevant bars. Labels of negative values are placed on the left, positive values are placed on the right of a given bar.
Advantages (based on Eisl & al., 2015, p. 24)	<ul style="list-style-type: none"> ▪ Single bar charts are multi-purpose: apart from for structural analyses, they may be utilised for enumerations, rank comparisons and benchmarks. ▪ Differences between the values that are being compared may be easier to note than is the case with pie charts.

	<ul style="list-style-type: none"> ▪ A large number of data points may be visualised in a clearly arranged form. ▪ Data points and data series may be directly labelled. ▪ Sorting the values (e.g. alphabetically or from the smallest to the largest value) may further improve legibility.
Related chart types (based on Hichert & Faisst, 2015, p. 28 ff.)	<ul style="list-style-type: none"> ▪ Stacked bar chart (reflecting more than one data series and one point in time/period only) ▪ Grouped bar chart (reflecting structural analysis for a primary scenario versus a reference scenario) ▪ Vertical pin chart (visualising relative variances in structural analyses) ▪ Vertical waterfall chart, further subdivided into: <ul style="list-style-type: none"> ○ calculation waterfall chart (where status bars reflect starting and resulting measures and contribution bars in between reflect additions/subtractions of other measures); <i>and</i> ○ vertical variance waterfall-chart (where status bars reflect a specific value at two different points in time, periods or scenarios and contribution bars structural variances).

Table 2: Single bar chart (based on Hichert & Faisst (2015) and Eisl & al. (2015))

2.1.2.2 Single column chart

Category	Horizontal charts
Use(s)	Single column charts are primarily suited to visualising <i>temporal developments of one data series</i> . (based on Hichert & Faisst, 2015, p. 20)
Constituents (based on Hichert & Faisst, 2015, p. 20 f.)	<ul style="list-style-type: none"> ▪ <i>Horizontal time axis</i> (representing the relevant points of time/relevant time periods) ▪ <i>Columns</i> (extending from the category axis to their relevant values) ▪ <i>Legends</i> (In this particular case, the name of the data series (i.e. legend) is already a constituent of the chart title, given that there is merely one data series. ▪ <i>Data labels</i> (Naming the values of the data series in accordance with the length of the relevant columns. Labels of negative values are placed below, positive values are placed above any given column.
Advantages (based on Eisl & al., 2015, p. 22)	<ul style="list-style-type: none"> ▪ Single column charts are suited for displaying temporal developments, as they perfectly support the mental concept of time series, by running from left to right. ▪ In addition, negative values can easily be displayed.
Related chart types (based on Hichert & Faisst, 2015, p. 21 ff.)	<ul style="list-style-type: none"> ▪ Stacked column chart (reflecting more than one data series) ▪ Grouped column chart (reflecting time series for a primary scenario versus a reference scenario) ▪ Horizontal pin chart (visualising relative variances in time-series analyses)

	<ul style="list-style-type: none"> ▪ Horizontal waterfall chart, further subdivided into: <ul style="list-style-type: none"> ○ growth waterfall-chart (where status columns reflect a stock measure¹ various points in time and the contribution columns in between changes [Δ]); <i>and</i> ○ horizontal variance waterfall-chart (where status columns reflect a flow measure² at two separate points in time/scenarios and the contribution columns in between reflect periodic variances).
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Table 3: Single column chart (based on Hichert & Faisst (2015) and Eisl & al. (2015))

2.1.2.3 Line chart

Category	Horizontal chart
Use(s)	Line charts are primarily suited to visualising <i>temporal developments of data series with a large number of data points.</i> (based on Hichert & Faisst, 2015, p. 25)
Constituents (based on Hichert & Faisst, 2015, p. 25)	<ul style="list-style-type: none"> ▪ <i>Horizontal time axis</i> (representing the relevant points of time/relevant time periods) ▪ <i>Lines</i> (≥ 1 lines with line markers representing values of the relevant data series) ▪ <i>Legends</i> (representing labels for the data series. The legend should be included in the chart title if the line chart consists of merely one data series. If, however, the line chart consists of more than one data series, the legend should be placed to the left of the farthest data point on the left-hand side, to the right of the farthest data point on the right-hand side or in the vicinity of the lines anywhere else in the chart. ▪ <i>Data labels</i> (Naming the values of the data points. Whenever possible, peaks (x_{max}) should be labelled above the line markers, valleys (x_{min}) below the line markers.
Advantages (based on Eisl & al., 2015, p. 23)	<ul style="list-style-type: none"> ▪ Line charts are best suited for displaying large numbers of data points and/or long time series. ▪ As opposed to column charts, trends and developments become better apparent in line charts. ▪ Line charts accommodate the mental concept of time series (cf. section 2.1.2.2 Single column chart). ▪ Both negative and positive values can be visualised. ▪ In many cases, direct labelling of data series (rather than utilising legends) is possible, which minimises confusion.
Disadvantages (based on Eisl & al., 2015, p. 23)	<ul style="list-style-type: none"> ▪ Lines may suggest ongoing timelines despite the lack of clear values in between the single data points. ▪ Labelling the data points may be problematic.

¹ Stock measures refer to items in the balance statement (Colander & Gamber, 2006, p. 55).

² Flow measures refer to items in the income statement (Colander & Gamber, 2006, p. 55).

Related chart types (based on Eisl & al., 2015, p. 24)	<ul style="list-style-type: none"> ▪ Grouped line chart ▪ Area charts (facilitating the visualisation of structure, as is the case for stacked column/bar charts).
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Table 4: Line chart (based on Hichert & Faisst (2015) and Eisl & al. (2015))

2.1.2.4 Scattergram (scatterplot)

Category	Charts with two value axes
Use(s) (based on Hichert & Faisst, 2015, p. 32)	Scattergrams (scatterplots) are frequently utilised to <i>visualise the relationship between two variables</i> . The data may be temporal or non-temporal.
Constituents (based on Hichert & Faisst, 2015, p. 32)	<ul style="list-style-type: none"> ▪ <i>Two value axes</i> (displaying the position of points in a two-dimensional coordinate system) ▪ For <i>legends</i> and <i>data labels</i>: please refer to the recommendations for vertical and horizontal charts above. There are currently no particular guidelines in terms of notation for this type of chart.
Advantages (based on Yau, 2011, p. 154 f.)	<ul style="list-style-type: none"> ▪ Scattergrams (scatterplots) are space-saving, as they use points rather than bins. ▪ Both temporal and non-temporal data may be displayed. ▪ Points may convey a better notion of flow from one point to another.
Related chart types	n/a

Table 5: Scattergram (scatterplot) (based on Hichert & Faisst (2015) and Yau (2011))

2.1.2.5 Bubble (portfolio) chart

Category	Charts with two value axes
Use(s) (based on Hichert & Faisst, 2015, p. 32)	Like scattergrams (scatterplots), bubble (portfolio) charts are frequently utilised to <i>visualise the relationship between two variables</i> .
Constituents (based on Hichert & Faisst, 2015, p. 32)	<ul style="list-style-type: none"> ▪ <i>Two value axes</i> (displaying the position of bubbles in a two-dimensional coordinate system) ▪ <i>Bubble areas/area size(s)</i> (displaying the third dimension) ▪ For <i>legends</i> and <i>data labels</i>, please refer to the recommendations for vertical and horizontal charts above. There are currently no particular guidelines in terms of notation for this type of chart.
Advantages (based on Yau, 2011, p. 256 and Hichert & Faisst, 2015, p. 32)	<ul style="list-style-type: none"> ▪ Bubble (portfolio) chart facilitate the comparison of three variables simultaneously: x, f(x) and area size of bubbles. ▪ A fourth dimension may be added by means of pie slices within the bubbles.
Related chart types	n/a

Table 6: Bubble (portfolio) chart (based on Hichert & Faisst (2015) and Yau (2015))

2.1.2.6 Other charts

Pie (circle) charts

Category	Other charts
Use(s)	Pie charts are suited for <i>part-to-whole comparisons</i> . (based on Schwabish, 2014, p. 222)
Constituents (based on Hichert & Faisst, 2015, p. 49 and Schwabish, 2014, p. 222)	<ul style="list-style-type: none"> ▪ <i>Sectors ("slices")</i> (representing the relative proportion to the total) ▪ <i>Legends</i> (naming the various groups/categories and stating their relative values/percentages) ▪ <i>Labels</i> (integrating data, groups/categories and relative values/percentages)
Advantages (based on Few, 2007, p. 13 f.)	<ul style="list-style-type: none"> ▪ The "part-to-whole" relationship is integrated into the chart in an evident way. ▪ Pie (circle) charts are best suited for comparing two sets of summed sectors.
Disadvantages (based on Few, 2007, p. 2 ff. and Eisl & al., 2015, p. 23)	<ul style="list-style-type: none"> ▪ Least effective of all charts. ▪ Any section that does not correspond to approx. 0%, 25%, 50%, 75% or 100% cannot easily be recognised. ▪ The size of a given sector is less discernible if it is not placed at the 12:00, 3:00, 6:00 or 9:00 position of a circle. (These positions are familiar to the eyes and brains of human beings, as they delimit 90° intervals from one another and each of them forms a right angle. In addition, human beings tend to underestimate acute angles and overestimate obtuse angles.) ▪ Pie (circle) charts may only be utilised if the parts add up to exactly 100%. ▪ Negative values cannot be represented. ▪ As opposed to other diagram types, pie (circle) charts need more space. ▪ Pie (circle) charts do not support the natural reading direction (i.e. left to right and top to bottom) and may thus delay information reception.
Related chart types	Doughnut charts

Table 7: Pie (circle) charts (based on Schwabish (2014), Hichert & Faisst (2015), Few (2007) and Eisl & al. (2015))

Combined charts

Although various combinations are possible (e.g. bars and pies or bars and lines), the most commonly used combination in financial reporting is columns and lines according to a study conducted by the University of Applied Sciences Upper Austria (FH OÖ) in association with KPMG (Eisl & al., 2015, p. 28).

Following the presentation of the various chart types, the layout of charts is explained next.

2.1.3 Design elements of diagrams

For better orientation, the design elements of charts are introduced based on a stacked column chart, given that this type of chart can include all required elements (Eisl & al., 2015, p. 28):

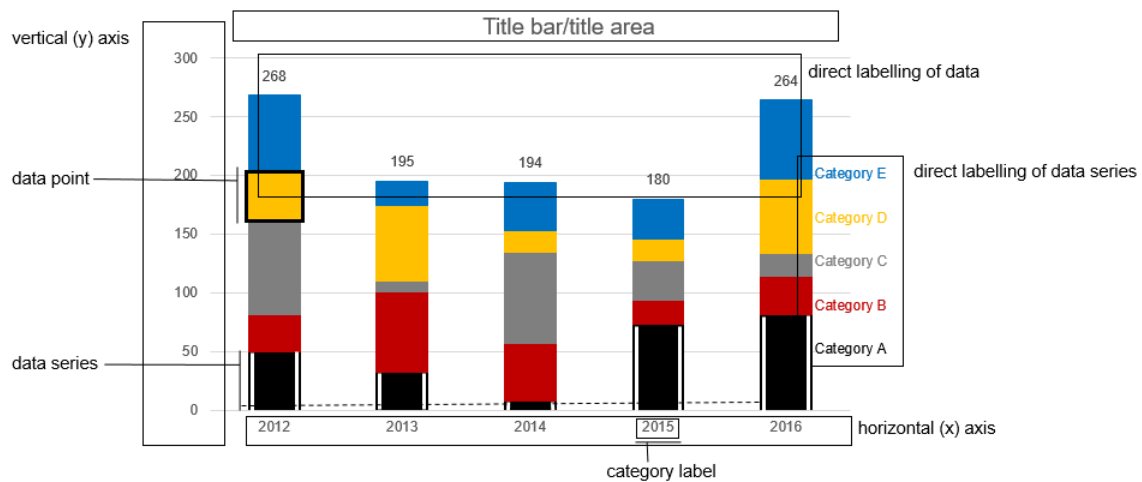


Figure 1: Design elements of charts (based on Eisl & al. (2015, p. 28))

2.1.3.1 Title

According to Griesfelder & Reinke (2013, p. 19), every diagram should be comprehensible on its own: standardised title information is therefore crucial for the comprehensibility of charts. The authors further explain that retrieving information from charts is notably more difficult if explanations and/or information pertaining to the chart is placed outside the diagram. For the correct interpretation of data, Eisl & al. (2015, p. 28) list the following minimum details:

- **Factual information** (→ What type of information is it? E.g. cost/income ratio)
- **Time** (→ What time period or point in time is displayed? E.g. February 2015)
- **Measuring unit** (→ What measuring units are used? E.g. bGBP, % etc.)
- **Organisational unit** (→ If the data is reported at the segment level: what organisational unit is reference made to? E.g. Wealth Management)
- **Additional information** (→ using messages, if required)

Titles should be positioned at the upper left hand side of a page; for better ease of comprehension, crucial parts may be highlighted in bold font (Hichert & Faisst, 2015, p. 83 ff.).

2.1.3.2 Subtitles

Subtitles (e.g. diagram/chart title, table numbers etc.), intended as complements to the (main) title, are typically used to identify elements that differ from the other elements on the same page (Hichert & Faisst, 2015, p. 84 f.).

2.1.3.3 Data/value labels

Value axes

Direct labelling of data points renders value axes superfluous – using them both may cause redundancies, using only value axes may render it difficult to read the individual values from the value axes (Griesfelder & Reinke, 2013, p. 20).

With respect to direct labelling, Hichert & Faisst (2015, p. 87) offer the following recommendations:

- i. Labels should not exceed three digits
- ii. Labels should be aligned horizontally
- iii. Labels should be placed next to the relevant objects or, if not possible, connecting lines should be utilised.

As regards point iii., the following table summarises the positioning recommended by Hichert & Faisst (2015, p. 87 ff.):

<u>Chart type</u>	Positioning with respect to the visualisation element(s)
Horizontal chart	above or below
Vertical chart	right or left
Stacked columns/bars chart	inside the data points (centred) or outside the data points (if data points are too small)
Charts with two value axes	above, below, right, left or in the centre (if bubble size permits)

Table 8: Positioning recommendations for labels (based on Hichert & Faisst (2015))

2.1.3.4 Data-series labels ("legends")

Whenever more than one data series are displayed in a chart, data-series labels become necessary and are often appended indirectly as a legend, which in turn impairs perception, as the human eye needs to continuously move from chart elements to the legend and vice versa (Griesfelder & Reinke, 2013, p. 20). Such eye movements could be avoided, if the following suggestions by Hichert & Faisst (2015, p. 85 ff.) are adopted:

<u>Chart type</u>	Positioning of legend(s)
Single column chart	integrated into title
Single bar chart	integrated into title
Stacked column chart	<ul style="list-style-type: none"> ▪ either to the left of leftmost column; <i>or</i> ▪ to the right of rightmost column.
Stacked bar chart	above top bar (centred)
Line chart	<ul style="list-style-type: none"> ▪ either to the right of line end; <i>or</i> ▪ close to course of line
Charts with two value axes	<ul style="list-style-type: none"> ▪ external (with respect to chart), next to symbols; <i>or</i> ▪ integrated into chart, next to typical points/bubbles.

Table 9: Positioning recommendations for data-series labels (legends) (based on Hichert & Faisst (2015))

Hichert & Faisst (2015, p. 85) further indicate that assisting lines can support the attribution of legends to the corresponding visualisation elements.

2.1.3.5 Time horizon

Displaying data from earlier periods is of particular interest, given that financial reporting conveys information regarding the performance of a company – the assessment of such performance only becomes both possible and reasonable with comparative values (Eisl & al., 2015, p. 30). A recent analysis of the DAX30 companies showed that, on average, 2.4 years are displayed and that 13% of the companies in question used a consistent time horizon for displaying data series (e.g. five years for multi-year comparisons) (Eisl & al., 2015, p. 30).

2.1.3.6 Measuring units

Following the recommendations of Hichert & Faisst (2015, p. 80 ff.), the format for units, numbers and dates should be consistent, as this can improve readability:

Currencies (according to Hichert & Faisst, 2015, p. 81)

The three-digit, ISO 4217 currency codes (e.g. GBP, EUR, USD etc.) are recommended along with "metric prefixes" (i.e. *k* for thousand, *m* for million, *b* for billion, *t* for trillion). The use of currency symbols (e.g. \$, ¥, £, € etc.) is discouraged whenever many different currencies are used.

Numbers (according to Hichert & Faisst, 2015, p. 81)

- Numbers in charts should not exceed three digits: more than three digits reduce legibility and do not usually contribute to better understanding.
- Based on ISO 80000-1³, a blank space should be used as a *thousand delimiter*.
- Based on ISO 80000-1, both a comma or a point may be used as a *decimal sign*.
- Negative values may be indicated by either using parentheses or a preceding minus sign.
- Positive values are preceded by the plus sign only if they reflect variances.

Dates (according to Hichert & Faisst, 2015, p. 82)

The ISO 8601 standard is recommended for the visualisation of dates: YYYY-MM-DD or YYYY-MM (where YYYY = year; MM = month; DD = day).

Next, the most frequent types of manipulations found in charts are explained.

2.1.4 Frequent types of manipulations found in charts

From a study conducted by the University of Applied Sciences Upper Austria (FH OÖ) in association with KPMG (Eisl & al., 2015, 32), it emerged that the annual reports of 2013 of the DAX30 companies contained, on average, 3.7 charts with distorted data visualisations. According to this study, the layout of charts was altered creating an over- or understatement in order for the visualised data to appear better than the actual data (Eisl & al., 2015, p. 31 f.).

Based on Hichert & Faisst (2015, p. 73 ff.), the layout of charts can be manipulated and thus impede objective comparison, by means of:

- **cut axes** (i.e. value axes that start at a number other than zero),

³ According to <http://www.ibcs-a.org/standards/103>, ISO 80000-1 is the successor to ISO 31-0 stated in Hichert & Faisst (2015, p. 81), which is the reason why, in this paper, it is used in lieu.

- **dissimilar class sizes** (i.e. class sizes of different width; e.g. 0–5, 6–10, 11–30 etc. in lieu of 0–10, 11–20, 21–30 etc.),
- **clipped columns and bars,**
- **two- and three-dimensional representations** (in lieu of linear representations) *and*
- **dissimilar scaling for same units.**

Such adjustments derogate from the "fair and true" principle in accounting and merely cast a better light on the relevant companies (Eisl & al., 2015, p. 31).

2.1.5 Tables and their categorisation

A structured list of numbers and/or texts is usually what one refers to as a table (Griesfelder & Reinke, 2013, p. 25). Hichert & Faisst (2015) offer the following definition:

"A table is a communication object in which data is arranged in two dimensions, i.e. (vertical) columns and (horizontal) rows. [...] The data are positioned at the intersections of rows and columns called table cells."
(Hichert & Faisst, 2015, p. 33)

As opposed to charts, which are meant to be perceived at one glance, tables are read and should therefore enable the readers to rapidly perceive their contents in an unambiguous way (Griesfelder & Reinke, 2013, p. 25). In financial reporting, tables have to comply with regulatory requirements (Eisl & al., 2015, p. 33). As a result, tables follow the recommendations of auditing companies, which naturally focus on content rather than perceptual aspects (Griesfelder & Reinke, 2013, p. 25).

The following table, which is based on Hichert & Faisst (2015, p. 45 ff.) (unless stated otherwise), provides a brief summary of the various table types:

Table name	Purpose of analysis/reporting
<i>One-dimensional tables</i>	
List ⁴	ease of finding things ordered in a record of short pieces of information (Cambridge Dictionaries Online, 2016)
<i>Two-dimensional tables</i>	
Time-series table	analyses of time series
Variance tables	analyses of scenarios

⁴ Lists are not in the scope of the present analysis.

Cross tables	analyses of structures
Combined tables	multiple analyses (combined tables feature at least two column types and/or row types)

Table 10: Table types and their purpose (based on Hichert & Faisst (2015))

The design elements of tables are explained next.

2.1.6 Design elements of tables

The following figure indicates the design elements of a table (based on Eisl & al., 2015, p. 33):

Title bar/title area (mCHF)		2015	2016	Δ	
hierarchy level 2	Current assets	351	312	-39	subtotals
auxiliary lines →	Cash	81	55	-26	
	Accounts receivable	270	257	-13	
hierarchy level 2	Non-current assets	1 358	1 581	+223	subtotals
row headers	Fixed assets	576	830	+254	
	Long-term investments	571	493	-78	
	Intangible assets	211	258	+47	
hierarchy level 1	Assets	1 628	1 893	+265	grand total

data area

Figure 2: Design elements of tables (based on Eisl & al. (2015, p. 33))

2.1.6.1 Title

As is the case with charts, Griesfelder & Reinke (2013, p. 25) explain that every table should be comprehensible on its own: standardised title information is therefore crucial for the comprehensibility of tables. According to them, retrieving information from tables is notably more difficult if explanations and/or information pertaining to the table are placed outside the diagram. For the correct interpretation of data, Griesfelder & Reinke (2013, p. 25) list the following minimum details that should be included along with a table:

- **Factual information** (→ What type of information is it about? E.g. cost/income ratio)
- **Legal entity** (→ What legal entity is being referenced? E.g. group, holding, subsidiary etc.)

- **Measuring unit** (→ What measuring units are used to display the data? E.g. nGBP, % etc.)

For further information, please also refer to section [2.1.3.1 Title](#).

2.1.6.2 Data labels

As already outlined in section [2.1.5 Tables and their categorisation](#), tables are read. In order to comprehend the content of tables, appropriate labelling is imperative (Griesfelder & Reinke, 2013, p. 27). Data series are usually labelled both in the top row(s) and in the first column on the left-hand side (Eisl & al., 2015, p. 34). Comprehensible tables require well-structured content, whereby the formatting of a table should support its logical structure, rendering the latter immediately apparent (Griesfelder & Reinke, 2013, p. 27). Hierarchy levels are of paramount importance (Eisl & al., 2015, p. 34). They may be achieved by using various simple formatting methods (e.g. indenture, row height, font size etc.) (Griesfelder & Reinke, 2013, p. 27). The following prevailing formats emerged from a study conducted by the University of Applied Sciences Upper Austria (FH OÖ) in association with KMPG (Eisl & al. 2015, p. 34) among the DAX30 companies:

Hierarchy level	Mostly utilised format
First row	bold or italic type + sum lines (usually both above and below the relevant row)
Second row	usually no special format
Standard row	mainly marked by indenture

Figure 3: Formatting of hierarchy level in tables (based on Eisl & al. (2015))

2.1.6.3 Time horizon

As a recent study conducted by the University of Applied Sciences Upper Austria (FH OÖ) in association with KMPG (Eisl & al., 2015, p. 34) revealed, DAX30 companies chose a time horizon of two to three years in their respective financial reporting. From the aforementioned study it further emerged that more than $\frac{3}{4}$ of the DAX30 companies displayed the current year in the first column succeeding the row-header column, thus derogating from the mental concept of time series. The display of temporal evolvments should run from left to right; consequently, the current period should always be placed to the right of earlier periods (Griesfelder & Reinke, 2013, p. 29).

2.1.6.4 Presentation of changes

Not only the values from earlier periods, but also the changes with respect to each other may be helpful when interpreting the current values (Eisl & al., 2015, p. 35). Visualising variances facilitates assessment (Hichert & Faisst, 2015, p. 52). Variances may be expressed either as absolute variances or as relative variances, whereby positive variances (irrespective of whether they are displayed in an absolute or relative form) should be marked with a preceding plus sign ("+") (Hichert & Faisst, 2015, p. 101 ff.). Absolute variances may be visualised by means of either columns or bars, whereby both width and scaling should equal the columns or bars they refer to (Hichert & Faisst, 2015, p. 101 f.). Relative variances, on the other hand, ought to be displayed by means of thin columns or thin bars (i.e. perpendicular/horizontal bars) (Hichert & Faisst, 2015, p. 103 f.). (The use of colours is discussed later in section [2.1.7 Colour coding](#).) Visualising changes is recommended also in tables: Hichert & Faisst (2015, p. 67 f.) regard single bar charts and waterfall bar charts embedded in tables (i.e. "table bars") as an effective way to visualise variances, emphasising that embedding chart elements in tables increases information density.

2.1.6.5 Measuring units

In addition to the guidelines already given in section [2.1.3.6 Measuring units](#), which apply for tables, Griesfelder & Reinke (2013, p. 30) state that transparent calculations foster clarity and trust in tables. Furthermore, they explain that, the basic calculation method being the addition, subtractions should be unambiguously marked by either a preceding minus sign, "-", or by using parentheses, "()".

2.1.7 Colour coding

Griesfelder & Reinke (2013, p. 22 ff.) assert that colours constitute an important, yet difficult issue – the reason is that colours draw and capture the attention of the reader and may easily shift the cognitive process involved when viewing diagrams to an emotional process. Griesfelder & Reinke (2013, p. 22 ff.) further argue that, in the context of business administration, emotional processes should be avoided whenever possible, given that the readers focus on business-related issues rather than ornamental corporate colours. As a result, they recommend that colours only be used if they serve a specific purpose.

With respect to tables, the authors emphasise that colours lacking a specific purpose are considered decorative in nature and should thus be avoided, as the arbitrary use of colours leads to decreased legibility (Griesfelder & Reinke. 2013, p. 30). While no consensus appears to exist on what colours and how many colours should be utilised, Hichert & Faisst (2015, p. 102) suggests the usage of the following three colours – at least for the visualisation of variances:

Impact	Colour			
	Readers without colour-vision impairments	👁	Readers with colour-vision impairments	👁
positive	■ green	■	■ blue-green	■
neutral	■ medium grey	■	■ medium grey	■
negative	■ red	■	■ red	■

👁 = as seen by an individual with colour-vision impairment

Table 11: Colour table for readers with and without colour-vision impairment (based on Hichert & Faisst (2015))

Lastly, it should be noted that, among other purposes, colours are also used to highlight the current period (Eisl & al., 2015, p. 35).

2.1.8 Barrier-free visualisations

As outlined in [table 11](#) above, Hichert & Faisst (2015, p. 102) suggest the use of distinct colours for both readers with and without colour-vision impairments. According to Jenny & Kelso (2007, p. 61 f.), 8% of the male and 0.4% of the female population suffer from colour-vision impairments⁵ that causes the individuals affected to confuse certain colours. The most frequent form of colour-vision impairments is the so-called "red-green blindness" (or deuteranopia): readers suffering from this form of colour-vision impairment see dark green, dark red, brown and orange as almost indistinguishable olive-green tones and can thus distinguish only a small number of colours (Jenny & Kelso, 2007, p. 63):

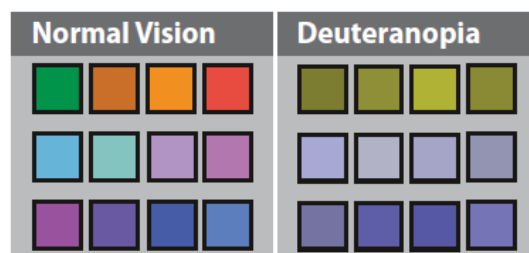


Figure 4: Colours seen by people with normal vision vs. people suffering from deuteranopia, a form of colour-vision impairment (Jenny & Kelso, 2007, p. 63)

⁵ inappropriately also commonly referred to as "colour blindness"

For such people, it is therefore impossible to distinguish between approval (green) and rejection (red) in the visualisation of a ballot (Jenny & Kelso, 2007, p. 63 f.). In addition, when prompted to look for a target object that involves colours, affected individuals are less fast and less successful than people without visual impairments (Cole, 2004, p. 271). Jenny & Kelso (2007, p. 61) consequently argue that, whenever readers are under time constraints, barrier-free visualisations play an important role for information graphics. Even if their recommendations (inter alia: choice of unambiguous colour combinations and direct labelling) are intended for the design of maps (Jenny & Kelso, 2007, p. 64), their key notions could also be useful for business information design. With respect to the use of barrier-free colours specifically in charts, there appears to exist little research yet – despite a significant increase in possibilities for using colours, nowadays, along with the risk of ineffective outcomes and misuse (Jefferson & Harvey, 2006, p. 40). Apart from a widespread use of colours for complex visualisations and information coding, Cole (2004, p. 258) also reports that a major bank asked for his assistance following a complaint received about hardly discernible colour-coding in its graphs of financial performance.

2.1.9 Readability: screen reading and online style

This section focusses on the readability of results presentations.

It may be assumed that, nowadays, results presentations are predominantly downloaded from the Internet and read on-screen rather than on paper. In this respect, Thurston (2006, p. 93 ff.) lists various differences between electronic texts and printed texts, explaining that, inter alia, electronic texts support associative thinking (as opposed to critical thinking for printed texts) and that the text-to-image ratio is larger for printed texts than for electronic texts. Furthermore, Thurston (2006, p. 101) cites little patience of on-screen readers for texts featuring high density as the reason for online writers using as few words as possible. Nielsen (2000, p. 101), in turn, states that reading on-screen decreases reading speed by approx. 25% as opposed to reading on paper.

Given the above issues, the question arises how on-screen readability may be improved and, by the same token, rendered more efficient. With respect to web pages, Nielsen (2000, p. 104) asserts that on-screen readers do not usually read texts word-by-word; rather, the vast majority of readers (79%) merely scans text, selecting single words and

sentences. As a result, he suggests that web pages should be written in a manner that supports this behaviour. According to Lynch & Horton (2008), a scanning-friendly style is characterised by the following features:

- brief sections of text
- concise and clear writing (inter alia: use of short words, omission of words, use of active voice)
- fronting (i.e. beginning with important information)
- avoiding conventions that are specific to a given culture, giving preference to global standards
- fronting keywords in each sentence to increase effectiveness of scanning.

In addition, Nielsen (2000, p. 105) recommends the use of bulleted lists, the use of just one idea for each paragraph and reducing the number of words by 50% (or more) compared to writing for print. In fact, in a study conducted by Nielsen (2000, p. 105), the latter point resulted in an improvement of usability by 58%. From the aforementioned study, it further emerged that layouts facilitating scanning improved usability by 47% and neutral language led to a usability improvement of 27%. In addition, Nielsen (2015) recommends refraining from complex, compound sentences containing conjunctions and several subordinate clauses, as they negatively affect short-term memory. Lastly, Meyer (2016) states that chunking (i.e. splitting content into small separate pieces) facilitates scanning and may improve comprehension and rememberability of contents. She further explains that ways of chunking texts include, inter alia, short text lines comprising approx. 50 to 70 characters and short paragraphs with white space as a separator.

2.1.10 Terminological consistency

This last part of the literature review briefly discusses the notion of terminological consistency.

If reports and presentations are thought of as specialised texts, they should feature distinctive characteristics, among which are clarity, simplicity and precision, information density, unambiguousness, logical consistency as well as use of defined technical terms, figures and symbols (Gotti, 2008, p. 29). Rogers (2008, p. 107) states that, in line with a common-sense perception, confusion in specialised texts may be avoided if the same

terms are consistently used for a given object/concept. In this respect, Hichert & Faisst (2015, p. 80) suggest that unambiguity and unified use of terms is the key to standardising terms and abbreviations in reports and presentations.

2.2 Methodology

In this part of the paper, the banks constituting the sample are introduced first. Subsequently, an explanation is given as to how the results presentations of the sample banks were analysed in terms of visualisations, specifically diagrams (charts) and tables. In addition, the methodology is explained for the analysis of colour coding, barrier-free visualisations, readability (including orthography) and terminological consistency. It should be noted that only selected aspects chosen of a wide range of possible criteria were considered for the present analysis, with the focus being on charts, tables and the remaining criteria (in the same order of importance).

2.2.1 Sample

In this section, the international banks constituting the sample for the present analysis are introduced.

For each of the continents Asia, North America and Europe, the leading five banks were selected by means of their market capitalisation as of 30 April 2015 based on Statista (2015). The following table contains the aforementioned banks, listed by the relevant continents, also indicating the relevant countries, market capitalisations and accounting standards adopted for their respective financial reporting:

#	Bank	Country	Market Capitalisation [bUSD]	Accounting standard			
				IFRS	US GAAP	PRC GAAP (CAS) ⁶	JGAAP ⁷
Asia							
1	Industrial and Commercial Bank of China (ICBC)	CHN	311.32	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	China Construction Bank (CCB)	CHN	244.88	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	Bank of China (BOC)	CHN	222.56	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
4	Agricultural Bank of China (ABC)	CHN	205.66	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	Mitsubishi UFJ Financial Group (MUFG)	JPN	99.88	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

⁶ People's Republic of China Generally Accepted Accounting Principles (PRC GAAP)/China Accounting Standards (CAS)

⁷ Japanese Generally Accepted Accounting Principles (JGAAP)

North America							
1	Wells Fargo (WFB)	USA	284.48	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	JP Morgan Chase (JPMC)	USA	235.85	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Bank of America (BoA)	USA	167.30	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	Citigroup (Citi)	USA	161.77	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	Royal Bank of Canada (RBC)	CAN	95.72	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Europe							
1	HSBC Holdings (HSBC)	GBR	193.03	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2	Banco Santander (BS)	ESP	106.52	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3	Lloyds Banking Group (LBG)	GBR	87.56	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4	BNP Paribas (BNPP)	FRA	78.85	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5	UBS	CHE	77.82	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Table 12: Sample of analysed banks

In summary, the sample contains four Chinese and one Japanese bank for the Asian continent, four US American and one Canadian bank for the North American continent as well as two British, one Spanish, one French and one Swiss bank for the European continent:

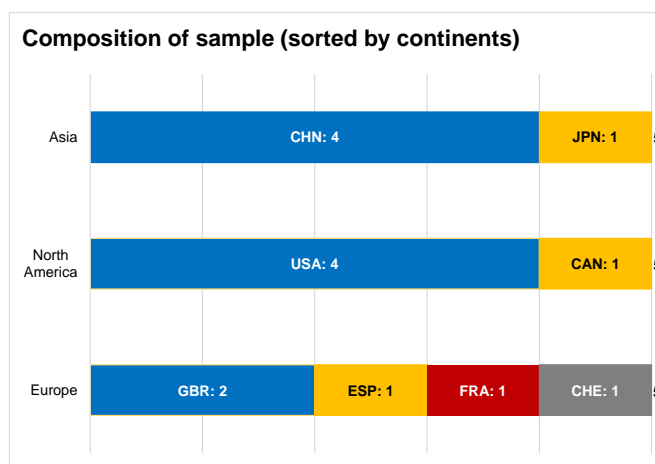


Figure 5: Composition of sample

2.2.2 Data collection

2.2.2.1 Earnings results presentations selected for the analysis

For each of the banks listed in section [2.2.1 Sample](#), the relevant (earnings) results presentations of the fourth quarter of 2015 (hereinafter: Q4 2015)⁸, were retrieved from the websites of the individual financial institutions (ICBC, 2016; CCB, 2016; BOC, 2016; ABC, 2016; MUFG, 2015; WFB, 2016; JPMC, 2016; BoA, 2016; Citi, 2016; RBC, 2016;

⁸ also referred to as *annual results 2015*

HSBC, 2016; BS, 2016; LBG, 2016; BNPP, 2016; UBS, 2016). MUFG constitutes the only exception: as financial reporting is based on fiscal years and the Japanese fiscal year ends in March, which coincides with the writing of the present thesis, the results of the fourth quarter ending in March 2016 had yet to be published (MUFG, 2016). As a result, the earnings results of the fiscal year 2014 (ended in March 2015) were considered for MUFG.

2.2.2.2 Pages considered for the analysis and numbering of analysed charts and tables

In addition, it should be noted that the number of total pages of the earnings presentations in the sample ranges from 16 (ICBC) to 115 (BS). In order to obtain a similar number of pages to analyse – at least to a certain extent –, only a selection of pages of the following banks' presentations were considered for the present analysis:

- **MUFG:**
total pages: 64; in scope for analysis: pp. 2–21 and 27–64 (\cong 58 pages)
- **BS:**
total pages: 115; in scope for analysis: pp. 1–40, 80–93 and 96–98 (\cong 57 pages)
- **BNPP:**
total pages: 103, in scope for analysis: pp. 2–16, 48–56 and 89–103 (\cong 40 pages)

The cover as well as "thank you", "Q&A" and similar sections were excluded from the page count/analysis for all banks in the sample – an exception was made for HSBC, where the cover page (p. 1) already contains key data. Lastly, all charts and tables subject to analysis were numbered by means of comment bubbles in the relevant results presentations (i.e. PDF files).

2.2.3 Data analysis

The data were analysed in 7 distinct criteria groups *Statistics [St]*, *ISO norms [IN]*, *Other format suggestions [OF]*, *Charts [Ch]*, *Tables [Tb]*, *Colour-coding (including barrier-free visualisations) [Co]* and *Linguistic aspects [LA]*. These criteria groups are briefly introduced next.

2.2.3.1 Statistics [St]

For each earnings presentation, the **number of analysed pages** [St-1], the **number of analysed charts** [St-2], the **number of pie, circle and doughnut charts** (hereinafter: PCD) [St-2^{bis}] and the **number of analysed tables** [St-3] was established. The **chart density** (CD) [St-4] expresses how many charts, on average, are present on each analysed page and was calculated by means of the following formula: $CD = \frac{\Sigma \text{ number of charts}}{\Sigma \text{ number of analysed pages}}$. Likewise, the **table density** (TD) [St-5] expresses how many tables, on average, are present on each analysed page and was calculated by means of the following formula: $TD = \frac{\Sigma \text{ number of tables}}{\Sigma \text{ number of analysed pages}}$. In addition, the **density of PCD charts** (PCDCD) [St-6] was calculated by means of the following formula: $PCDCD = \frac{\Sigma \text{ number of PCD charts}}{\Sigma \text{ number of analysed pages}}$. It shall express the average number of PCD charts present on each analysed page. It was also determined whether each bank respected a **time horizon** of at least two periods [St-7]⁹ and how many periods (e.g. quarters, years) were utilised for multi-period analyses. Lastly, the relevant results presentations were checked for any **comparisons to benchmarks** and/or **peers** and peer groups [St-8].

2.2.3.2 ISO norms [IN]

For this criteria group, it was assessed to what extent the banks in the sample make use of **ISO 4217 currency codes** (e.g. CNY, USD, EUR etc.) [IN-1]. For the sake of uniformity and simplicity, well known currency symbols (e.g. \$; £, ¥ etc.) were not considered. This criterion was calculated by the formula $\frac{\Sigma \text{ of non-observances}}{\Sigma \text{ number of analysed pages}}$, which expresses how many non-observances there are on average per analysed page. Along with the ISO 4217 currency codes, the use of **metric prefixes** [IN-2] (e.g. *k* for thousands, *m* for millions, *b* for billions, *t* for trillions etc.) was established, again, by means of the average of non-observances per analysed page (cf. formula above). Likewise, the use of a **space as a thousand delimiter** in accordance with ISO 80000-1 [IN-3] (e.g. 2 841 in lieu of 2,841, 2.841 or 2'841) was analysed. The consistent use of **either a comma or point as a decimal sign** in accordance with ISO 80000-1 [IN-4], in turn, was evaluated using the inconsistency rate: if both points and commas were used in a given chart or table, the rate of inconsistency was calculated using the formula

⁹ Indications such as QoQ (i.e. Quarter over Quarter), YoY (i.e. Year over Year) and indications such as *previous year vs current year* (e.g. 2014 vs 2015) were counted as one period each, as they implicitly refer to another period.

$\frac{\Sigma \text{ of commas}}{\Sigma \text{ of points}}$. To conclude, the use of the **ISO 8601 data format** YYYY-MM-DD and YYYY-MM **[IN-5]** was analysed by calculating the average number of non-observances per analysed page (cf. formula as for IN-1, IN-2 and IN-3).

2.2.3.3 Other format suggestions [OF]

With regard to prefixing numbers, it was assessed whether **negative values** were generally indicated **with** a preceding "-" sign or put into **parenthesis** "()" **[OF-1]**. For **positive values**, it was established whether they were indicated **with** a preceding "+" sign merely in cases of variances **[OF-2]**. Both criteria were analysed using the formula $\frac{\Sigma \text{ of non-observances}}{\Sigma \text{ number of analysed pages}}$.

2.2.3.4 Charts [Ch]

Firstly, it was established whether the **correct chart types** were used **[Ch-1]** (in accordance with the guidelines outlined in section [2.1.2 Charts and their categorisation](#)). For each chart, the chart type used (i.e. actual chart type) was compared to the required chart type. If for a given chart the required chart type matched the actual chart type, a score of 1 was assigned. In the opposite case, a score of 0 ("zero") was attributed. For the sake of simplicity, where grouped bar/column charts could (also) have been used, the required chart was always defined as single bar/column chart. Eventually, the mean (\bar{x}) of all scores assigned to each chart was calculated.

Secondly, the **data density** (hereinafter: *DD*) **[Ch-2]**, expressing how many data points may be found per square centimetre [cm^2] of a chart area, was computed. The chart area was measured using the Screen Ruler from WonderWebWare¹⁰ and covered the extremities of each chart, excluding the title (bar) and notes, but including legends that are strictly necessary for the understanding of the diagram. The following example explains how the data points were counted:

¹⁰ For the present analysis, the relevant charts were measured on a tablet from Microsoft Surface using zoom factor = 100%. It should be noted that results may differ if the same measurements are effected on other computers and/or using other zoom factors.

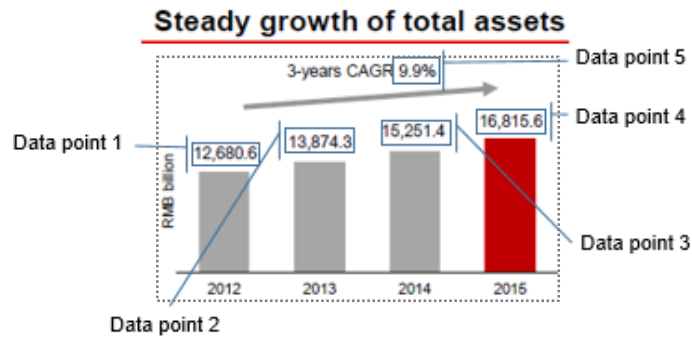


Figure 6: Count of data points (example)

Each chart was also assessed in terms **direct labelling** [Ch-3]. Both values and data series should be directly labelled, thus rendering legends superfluous and reducing eye movements. Consequently, the direct labelling rate (hereinafter: *DLR*) was calculated as follows:
$$\frac{\Sigma \text{ number of direct labels for values} + \Sigma \text{ number of direct labels for data series}}{\Sigma \text{ number of direct and indirect labels for values and data series}}$$
.

Furthermore, in each earnings presentation, **distortions of information** (hereinafter: *DI*) [Ch-4] were verified by means of the formula
$$\frac{\Sigma \text{ of charts with cut axes} + \text{clipped bars/columns}}{\Sigma \text{ of analysed charts}}$$
. In addition, charts with an apparent questionable scaling were also added to the numerator of the aforementioned formula.

The last criterion for charts consisted in assessing whether charts reflecting time series respected the **temporal development**, supporting the **mental concept of time** [Ch-5]. In particular, earlier periods should be placed on the left-hand side and current periods on the right-hand side for column charts and line charts, while earlier periods should be at the top and current periods at the bottom for bar charts. For each presentation, the number of charts with chronological order as well as the number of charts with reverse chronological order was counted. Subsequently, the average number of charts with reverse chronological order was analysed by means of the following formula:
$$\frac{\Sigma \text{ number of charts with reverse chronological visualisations}}{\Sigma \text{ number of analysed charts}}$$
.

2.2.3.5 Tables [Tb]

As a start, the same aspect applies as for charts: earlier periods should be displayed on the left-hand side, current periods on the right-hand side of a table. For each presentation, the number of tables with chronological order as well as the number of charts with reverse chronological order were counted. Subsequently, the average number of **tables**

with reverse chronological order [Tb-1] were analysed by means of the following formula: $\frac{\Sigma \text{ number of tables with reverse chronological column order}}{\Sigma \text{ number of analysed tables}}$.

Furthermore, the **labels** (i.e. column headers and row headers) of each table were assessed for their completeness, correctness and appropriateness [Tb-2]. A score of 0 ("zero") was assigned to tables featuring missing, incomplete, incorrect and/or inappropriate labels. In the opposite case, the score was 1. Declarations such as "in \$ millions" placed in the first column header to the left (in lieu of graphically separated, cf. below, or in the title bar) were deemed to be inappropriate and led to a score of 0 ("zero"):

Inappropriate label:

[mUSD]	2015	2016
Sales	1 847	2 081

Acceptable label:

[mUSD]	2015	2016
Sales	1 847	2 081

Table 13: Inappropriate labels vs appropriate labels

Likewise, in cases where two tables followed one another using the same column header, causing long eye movements and/or confusion as to whether the same header should apply also for the second table, the score equalled 0 ("zero"):

4Q15 Financial results¹

\$B. excluding EPS				
Applies to first table only				\$ O/(U)
Applies to both tables				
	4Q15	3Q15	4Q14	
Net interest income	\$11.5	\$0.3	\$0.2	
Noninterest revenue	12.2	(0.1)	–	
Revenue (FTE) ¹	23.7	0.2	0.2	
Expense	14.3	(1.1)	(1.1)	
Credit costs	1.3	0.6	0.4	
Reported net income	\$5.4	(\$1.4)	\$0.5	
Net income applicable to common stockholders	\$4.9	(\$1.4)	\$0.4	
Reported EPS	\$1.32	(\$0.36)	\$0.13	
ROE ²	4Q15	ROE	OH ratio	
	CCB	18%	56%	9%
	CIB	10%	63%	12%
	CB	15%	43%	9%
	AM	21%	72%	11%
ROTC ^{2,3}				11
Overhead ratio ²				60
Memo: Adjusted expense ⁴	\$13.6	(\$0.4)	(\$0.7)	65
Memo: Adjusted overhead ratio ^{1,2,4}	57%	60%	61%	

Table 14: Examples of confusing column headers

In terms of text alignment, the following two points were analysed with the relevant formulas:

- **texts** should be generally **left-justified** (except in titles, headings and direct labels in charts) [Tb-3]. Formula: $\frac{\Sigma \text{ of tables where texts are NOT left-justified}}{\Sigma \text{ of analysed tables}}$

- **numbers** should be **right-justified** [Tb-4]. Formula:

$$\frac{\Sigma \text{ of tables where numbers are NOT right-justified}}{\Sigma \text{ of analysed tables}}$$

As a last criterion, it was verified whether tables contained variance data (denoted as *change*, Δ , *QoQ*, *YoY*, *20nn vs 20nn*). In the affirmative case, it was further assessed whether the variance data was visualised by means of appropriate charts (i.e. horizontal/vertical pin charts for relative variances and horizontal/vertical bar charts for absolute variances) [Tb-5]. If the variance was visualised, the score equalled 1, if not 0 ("zero"). Lastly, the mean value (\bar{x}) of scores assigned to each table was computed.

2.2.3.6 Colour coding [Co]

For each earnings presentation, the number of each individual **meanings for each colour utilised** (including tones, i.e. white, grey and black) was counted [Co-1], whereby each shade of a given colour was counted as a single colour. The colour-consistency rate was then computed as follows:

$$\frac{\text{Number of various meanings per colour throughout all charts \& tables}}{\Sigma \text{ of all colours utilised in all charts and tables}}$$

Moreover, charts and tables that state positive, neutral or negative impacts were identified. As already outlined in section [2.1.7 Colour coding](#), the suggested colours are blue-green, medium grey and red (in the same order). In such instances, it was established whether or not these colours were used. The relevant rate (i.e. of **correct colour usage**) was established by means of the following formula:

$$\frac{\Sigma \text{ number of impacts highlighted in the correct colour}}{\Sigma \text{ number of positive, neutral \& negative impacts}} \text{ [Co-2].}$$

In addition, each chart was viewed from the perspective of a reader with colour-vision impairment using the software Color Oracle¹¹, which emulates deuteranopia, a form of red-green confusion. The number of charts whose colours were **difficult to discern** for such readers were counted. For the assessment of this criterion [Co-3], the following formula was applied: $\frac{\Sigma \text{ number of charts \& tables with problematic colours}}{\Sigma \text{ number of analysed charts \& tables}}$.

¹¹ downloaded from <http://colororacle.org/>

2.2.3.7 Linguistic aspects [LA]

This high-level analysis of readability [LA-1] consisted in assessing whether, as a general rule, the phrases or sentences used in each earnings presentations tended to be simple or complex using subordination. Preference was given to simple phrases or sentences that place important information at the beginning (i.e. "fronting") to long, complex, subordinated sentences. Example:

Preferred: simple phrases/sentences	Suboptimal: same meaning, but complex, subordinated phrase/sentence
<p>Volumes up 11% in 2015 (down 5.7% in 2014) [Word count: 9]</p>	<p>In 2015, volumes up 11%, compared to decline of 5.7% in 2014. [Word count: 12]</p> <p>In 2015, volumes augmented by a percentage of 11% with respect to the previous year when a decline of 5.7% was recorded. [Word count: 22]</p> <hr/> <p>Red = fronted time adverbial: important information follows after. Blue = subordinate clause adding complexity to the phrase/sentence.</p>

Table 15: Examples of simple and complex phrases/sentences

The readability was subsequently established using the formula $\frac{\Sigma \text{ of simple phrases/sentences}}{\Sigma \text{ of analysed phrases/sentences}}$.

In addition, if present, **orthographic errors [LA-2]** were noted and counted for each results presentation. As is the case for criterion LA-1, this analysis was conducted on a high-level basis by means of the formula $\frac{\Sigma \text{ of orthographic errors}}{\Sigma \text{ of analysed pages}}$. This set of criteria concludes with the high-level assessment of **terminological consistency [LA-3]**. For this criterion, merely the number of inconsistently used terms were counted (i.e. one specific notion/concept was multiplied by its variants; e.g. *MM*, *m* or *mill.* for *millions* = 3 variants for the same concept).

2.2.4 Ranking and scoring

The 15 banks forming the sample were ranked for each of the abovementioned criteria, i.e. IN-1 ... IN-5, OF-1 ... OF-2, Ch-1 ... Ch-5, Tb-1 ... Tb-5, Co-1 ... Co-3 and LA-1 ... LA-5. The ranking was conducted using the Excel formula RANK(num-

ber,ref,[order]). If, for instance, an average of non-observances was the subject of ranking, inverse ranking was applied, i.e. the bank with the lowest score would rank first. Otherwise, normal ranking was applied, i.e. the bank with the highest value would rank first (as is the case, for instance, for criterion Ch-2 *Data density*). The individual score was subsequently converted into a rank, using the following values:

Rank	Points	Rank	Points	Rank	Points
Rank 1	3.50 pts.	Rank 6	2.25 pts.	Rank 11	1.00 pts.
Rank 2	3.25 pts.	Rank 7	2.00 pts.	Rank 12	0.75 pts.
Rank 3	3.00 pts.	Rank 8	1.75 pts.	Rank 13	0.50 pts.
Rank 4	2.75 pts.	Rank 9	1.50 pts.	Rank 14	0.25 pts.
Rank 5	2.50 pts.	Rank 10	1.25 pts.	Rank 15	0.00 pts.

Table 16: Ranks and scores

For each bank, the scores assigned within each criteria group were added up. The banks were ranked again by the total score achieved in each criteria group. The total scores of the relevant five Asian, five North American and five European banks were added, in turn, to create a ranking between continents for each criteria group. The total scores per continents and per criteria group were added, again, to obtain the overall ranking between the three continents Asia, North America and Europe.

Due to missing benchmarks specific to results presentations, the criteria from the group *Statistics [St]* were neither considered for scoring nor for the overall ranking; rather the individual criteria St-4 (i.e. chart density), St-5 (i.e. table density) and St-6 (PCD density) were ranked for statistical purposes only.

For more than one bank sharing the last rank with a value of 0.00 (or 1.00 in the event of non-observance rates) for any given criterion (e.g. two banks ranked both 14th out of 15) the score of zero (0) supersedes the score for the relevant ranks shown in [table 16](#) above.

3 Results

In this part of the paper, [section 3.1](#) lists the analysis results for each criteria group, offering an overall ranking at the end, while [section 3.2](#) discusses the findings.

3.1 Findings

In this section, the findings are listed in the same order of the criteria already introduced in section [2.2.3 Data analysis](#).

3.1.1 Statistics [St]

The following paragraphs present key data with regard to the statistical analysis, which were not considered for the ranking due to the absence of specific benchmarks for results presentations.

3.1.1.1 Chart density (CD) [St-4]

The mean value (\bar{x}) with respect to the chart density (CD) of all analysed banks is 1.11, with a median (\tilde{x}) of 1.00. For the Asian banks, ABC has the highest CD (1.68) while ICBC the lowest CD (0.71). For the North American banks, the highest CD can be found at BoA (1.82), the lowest at JPMC (0.36). As regards the European banks, UBS presents the highest CD (1.86), while BS has the lowest (0.95). Globally, UBS ranks first (1.82), whereas JPMC ranks last (0.36).

3.1.1.2 Table density (TB) [St-5]

Considering table density, the mean value (\bar{x}) for the entire sample amounts to 0.52, with \tilde{x} being 0.41. For the Asian continent, MUFG shows the highest TD (0.43), CCB the lowest (0.03). The highest TD for the North American banks was recorded for JPMC (1.27), the lowest for WFB (0.56). In the European section of the sample, HSBC takes the first place (0.83), LBG the last (0.23). Overall, the highest TD could be found in JPMC's results presentation (1.27), the lowest in CCB's results presentation (0.03).

The following scatterplot shows the ranking of each bank in terms of both CD and TD:

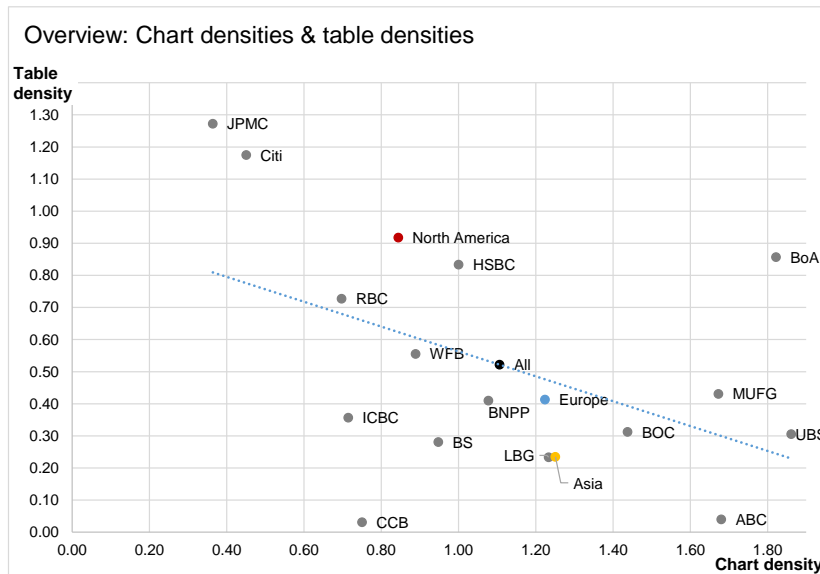


Figure 7: Overview of chart densities & table densities

3.1.1.3 Pie, circle and doughnut chart density (PCDCD) [St-6]

The mean value (\bar{x}) in terms of PCDC density amounts to 0.10 ($\tilde{x} = 0.09$). With no PCD charts at all, CCB ranks first among the analysed Asian banks, while ICBC ranks last (PCDCD = 0.21). For the North American banks, the lowest PCDCD was found in JPMC's results presentation (0.00), the highest in RBC's presentation (0.12). As regards the European peers, LBG's PCDCD is the lowest (0.00), while HSBC's shows the highest density (0.30). In general, CCB, JPMC and LBG share rank no. 1 with no PCD charts in their presentations, HSBC ranks last with a density of 0.30.

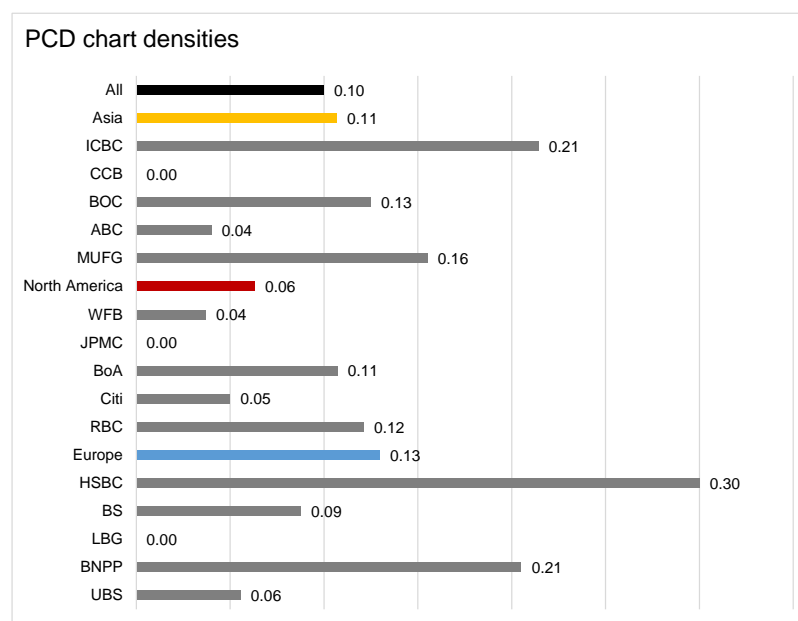


Figure 8: Overview of PCD chart densities

3.1.1.4 Time horizons [St-7] and comparisons to benchmarks/peers [St-8]

The analysis of the time horizons [St-7] showed that each bank in the sample respects the minimum of two periods. The number of periods (e.g. quarters, years) for multi-period comparisons varies widely, with a maximum of 19 periods recorded in MUFG's results presentation. Lastly, the data analysis revealed that only a minority of banks offers a direct comparison either to a benchmark or peers/peer group (average), namely BOC (4 comparisons), BS (2 comparisons), RBC, HSBC and LBG (1 comparison each).

3.1.2 ISO norms [IN]

In this part of the findings, the results of the analysis in terms of adherence to ISO norms [IN] are shown.

In general, it emerged from the analysis that, when it comes to adhering to the ISO norms introduced in section [2.2.3.2 ISO norms \[IN\]](#), the Asian banks rank first, followed by the European banks and, lastly the North American banks in the sample.

Overall, a high rate of non-observances per analysed pages could be identified for criterion [IN-1](#) (i.e. use of 3-digit ISO 4217 currency code), with a mean value (\bar{x}) of 7.65 ($\tilde{x} = 4.70$). Likewise, with a mean of 3.38 non-observances per analysed pages, \bar{x} is rather high for criterion [IN-2](#) (i.e. use of metric prefixes along with ISO 4217 currency codes) ($\tilde{x} = 2.40$). The second highest mean of non-observances was found for criterion [IN-3](#) (i.e. ISO 80000-1) with a mean of 5.35 ($\tilde{x} = 3.81$). Conversely, the inconsistency rate with respect to the use of decimal signs (either point or comma/ISO 80000-1; i.e. criterion [IN-4](#)) is low, with $\bar{x} = 0.02$ ($\tilde{x} = 0.00$). Lastly, the mean (\bar{x}) of non-observances for the international data format according to ISO 8601 (i.e. criterion [IN-5](#)) amounts to 0.95 ($\tilde{x} = 0.70$).

The following table lists the first and last ranks for each criterion IN-1 to IN-5 in each of the continents:

Cri- terion	Asia			North America			Europe		
	First rank (\bar{x})	Last rank (\bar{x})	\bar{x} (\tilde{x})	First rank (\bar{x})	Last rank (\bar{x})	\bar{x} (\tilde{x})	First rank (\bar{x})	Last rank (\bar{x})	\bar{x} (\tilde{x})
IN-1	CCB (1.19)	MUFG (5.03)	2.68 (2.00)	RBC (5.36)	BoA ■ (31.82)	17.58 (19.77)	UBS ■ (0.00)	BNPP (5.90)	2.70 (2.13)
IN-2	CCB ■ (1.00)	MUFG (3.21)	1.98 (1.72)	Citi (1.60)	BoA ■ (7.07)	4.48 (4.55)	BS (1.54)	BNPP (5.44)	3.68 (3.90)
IN-3	CCB ■ (1.75)	ICBC (4.36)	3.15 (3.48)	RBC (2.42)	Citi ■ (15.93)	7.06 (6.41)	HSBC (12.53)	LBG (2.75)	5.84 (5.18)
IN-4	■ ex æquo ¹²	–	0.00 (0.00)	■ ex æquo ¹³	–	0.00 (0.00)	■ ex æquo ¹⁴	BS ■ (0.17)	0.06 (0.00)
IN-5	BOC ■ (0.06)	MUFG ■ (4.19)	0.99 (0.20)	Citi (0.28)	JPMC (2.32)	0.98 (0.79)	BS (0.07)	BNPP (1.23)	0.88 (1.19)

■ = first rank ■ last rank
Table 17: ISO norms [IN]: Summary of first and last ranks in each continent

The following bar chart offers an overview in terms of ranking by continents and individual banks, with the value stated on the right-hand side of each bar indicating the respective scores.

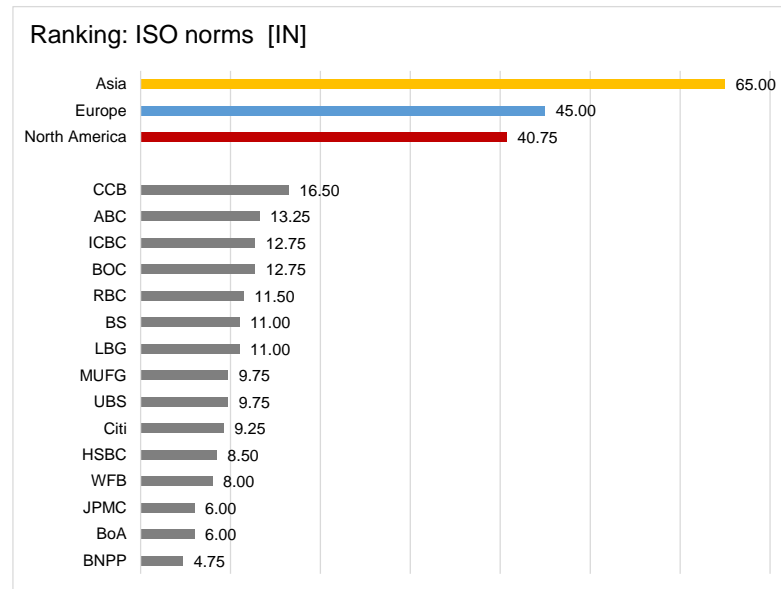


Figure 9: Ranking: ISO norms [IN]

3.1.3 Other format suggestions [OF]

Next, the findings referring to the analysis of the criteria group *OF* are presented.

¹² With no inconsistencies, ICBC, CCB, BOC, ABC and MUFG share the first rank.

¹³ With no inconsistencies, WFB, JPMC, BoA, Citi and RBC share the first rank.

¹⁴ With no inconsistencies, HSBC, LBG and UBS share the first rank.

3.1.3.1 Indication of negative values by means of "(" or preceding "-" [OF-1]

In the entire sample, non-compliance with the criterion [OF-1](#) is low with an overall mean (\bar{x}) of 0.08 ($\tilde{x} = 0.00$). For Asian banks, the number of non-observances is higher ($\bar{x} = 0.25, \tilde{x} = 0.07$), with ICBC having no breaches (0.00) and ranking first, while ABC ranks last (1.00). An ex æquo situation was found for the American banks: all were found to be compliant with the format suggestion and thus share the first rank. The same situation applies for European banks.

3.1.3.2 Indication of positive values by means of preceding "+" only in case of variances [OF-2]

For this criterion [\[OF-2\]](#), the mean (\bar{x}) of non-observances for all 15 banks in the sample amounts to 0.81, with $\tilde{x} = 0.97$. For the Asian sub-sample, the mean (\bar{x}) of non-observances amounts to 0.81 ($\tilde{x} = 0.97$), with ICBC ranking first (0.45) and CCB as well as ABC both ranking last (1.00). A higher mean (\bar{x}) of 0.96 ($\tilde{x} = 1.00$) was computed for the North American banks, with RBC on the first rank (0.88) and JPMC, BoA and Citi all on the last rank (1.00). For the European sub-sample, a lower mean (\bar{x}) of non-compliance was found (0.66; $\tilde{x} = 0.77$) – BNPP ranks first (0.12), LBG ranks last (1.00).

The following chart depicts the consolidated ranking for criteria group *OF* on both an individual basis and on a continent basis.

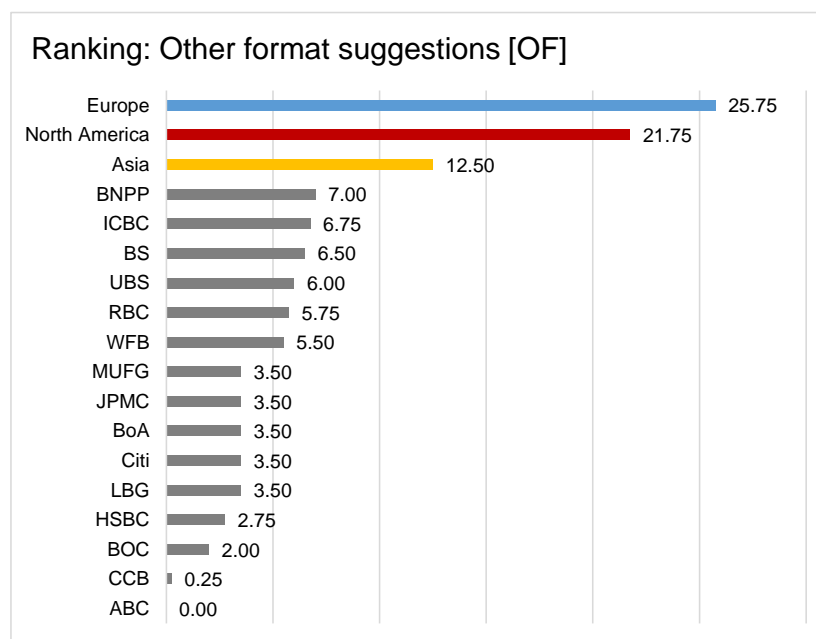


Figure 10: Ranking: Other format suggestions [OF]

Both criteria taken into consideration, the European banks rank first in terms of adherence to the indication of negative and positive values, followed by the North American and Asian banks.

3.1.4 Charts [Ch]

Next, the findings of the chart criteria are presented.

The five North American banks rank first within the criteria group *Ch*, followed by the European banks and the Asian banks, which rank last.

Across all 15 banks in the sample, a mean (\bar{x}) of correctly selected chart types of 0.77 could be computed for criterion [Ch-1](#) (with $\tilde{x} = 0.78$). As regards criterion [Ch-2](#), the mean data density amounts to $0.43 \frac{\text{data points}}{\text{cm}^2}$ ($\tilde{x} = 0.30 \frac{\text{data points}}{\text{cm}^2}$). The mean and median values in terms of direct labelling rate are both 0.67 ([Ch-3](#)), while a mean value of 0.15 charts ($\tilde{x} = 0.04$ charts) was computed for charts featuring distortions of information ([Ch-4](#)). Lastly, the chronological order ([Ch-5](#)) was, on average, respected by almost every bank (with a mean of 0.05 charts with reverse chronological visualisations; $\tilde{x} = 0.00$).

A summary of the first and last ranks for each criterion Ch-1 to Ch-5 in each continent is given below:

Cri- terion	Asia			North America			Europe		
	First rank (\bar{x})	Last rank (\bar{x})	\bar{x} (\tilde{x})	First rank (\bar{x})	Last rank (\bar{x})	\bar{x} (\tilde{x})	First rank (\bar{x})	Last rank (\bar{x})	\bar{x} (\tilde{x})
Ch-1	ABC (0.90)	ICBC ■ (0.30)	0.73 (0.83)	JPMC ■ (1.00)	Citi (0.78)	0.88 (0.88)	UBS (0.88)	HSBC (0.47)	0.70 (0.70)
Ch-2	MUFG (0.40)	CCB ■ (0.08)	0.19 (0.13)	JPMC (1.66)	WFB (0.21)	0.62 (0.43)	UBS ■ (0.67)	BS (0.21)	0.48 (0.61)
Ch-3	ABC (0.80)	ICBC (0.55)	0.66 (0.63)	WFB (0.71)	JPMC ■ (0.38)	0.59 (0.64)	BS (0.95)	LBG (0.83)	0.77 (0.80)
Ch-4	ICBC ■ (0.00)	ABC ■ (0.79)	0.22 (0.04)	■ ex æquo ¹⁵	WFB (0.25)	0.05 (0.00)	BNPP (0.02)	LBG (0.38)	0.19 (0.17)
Ch-5	■ ex æquo ¹⁶	ICBC ■ (1.00)	0.21 (0.00)	■ ex æquo ¹⁷	BoA (0.02)	0.00 (0.00)	■ ex æquo ¹⁸	UBS (0.02)	0.00 (0.00)

■ = first rank ■ = last rank

Table 18: Charts [Ch]: Summary of first and last ranks in each continent

¹⁵ With no cut axes and clipped bars/columns in their charts, JPMC, Citi and RBC share the first rank.

¹⁶ With no reverse chronological visualisations, BOC, ABC and MUFG share the first rank.

¹⁷ With no reverse chronological visualisations, JPMC, Citi and RBC share the first rank.

¹⁸ With no reverse chronological visualisations, HSBC, BS, LBG and BNPP share the first rank.

The following bar chart offers an overview for criteria group *Ch* in terms of ranking by individual banks and continents:

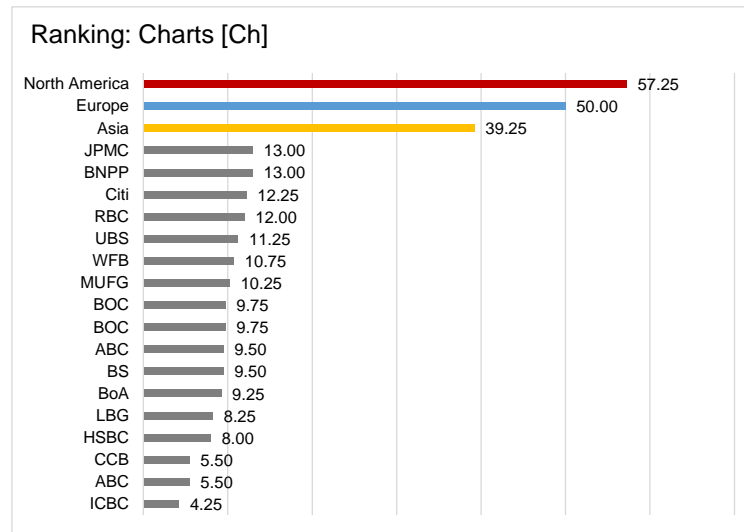


Figure 11: Ranking: Charts [Ch]

3.1.5 Tables [Tb]

This section lists the results for the analysis conducted with criterion group *Tb*.

On a consolidated basis, the American banks are in the first rank, followed by the European banks, while the Asians banks are on the last rank.

For the entire sample, a mean (\bar{x}) of 0.69 tables were observed featuring a reverse chronological column order ([Tb-1](#)) ($\tilde{x} = 1.00$). For criterion [Tb-2](#), a mean of 0.58 appropriately labelled tables was computed, with $\tilde{x} = 0.68$. On average, only 0.08 tables (\bar{x}) were found to have a text alignment that is not left-justified ($\tilde{x} = 0.00$) ([Tb-3](#)). Conversely, 0.26 tables (\bar{x}) were found, on average, to have an incorrect alignment of numbers (i.e. not right-justified; [Tb-4](#)) ($\tilde{x} = 0.17$). Lastly, only 0.02 tables (\bar{x}) that feature variance data visualised those by means of an appropriate chart ([Tb-5](#)) ($\tilde{x} = 0.00$).

The following table summarises first and last ranks for each criterion Tb-1 to Tb-5 in each continents:

Criterion	Asia			North America			Europe		
	First rank (\bar{x})	Last rank (\bar{x})	\bar{x} (\tilde{x})	First rank (\bar{x})	Last rank (\bar{x})	\bar{x} (\tilde{x})	First rank (\bar{x})	Last rank (\bar{x})	\bar{x} (\tilde{x})
Tb-1	MUFG ■ 0.00	ex æquo ¹⁹ ■ 1.00	0.80 (1.00)	RBC 0.73	ex æquo ²⁰ ■ 1.00	0.91 (1.00)	ex æquo ²¹ ■ 0.00	LBG 1.00	0.37 (0.00)
Tb-2	ABC ■ 1.00	CCB ■ 0.00	0.58 (0.80)	Citi ■ 1.00	WFB ■ 0.00	0.69 (0.83)	BS 0.69	UBS 0.36	0.48 (0.43)
Tb-3	ex æquo ²² ■ 0.00	ex æquo ²³ 0.20	0.12 (0.20)	ex æquo ²⁴ ■ 0.00	RBC 0.05	0.01 (0.00)	LBG ■ 0.00	BS ■ 0.29	0.12 (0.13)
Tb-4	BOC ■ 0.00	ex æquo ²⁵ ■ 1.00	0.47 (0.20)	ex æquo ²⁶ ■ 0.00	RBC 0.38	0.10 (0.00)	HSBC 0.12	BNPP 0.31	0.21 (0.18)
Tb-5	–	ex æquo ²⁷ ■ 0.00	0.00 (0.00)	–	ex æquo ²⁸ ■ 0.00	0.00 (0.00)	HSBC ■ 0.30	ex æquo ²⁹ ■ 0.00	0.06 (0.00)

■ = first rank ■ = last rank

Table 19: Tables [Tb]: Summary of first and last ranks in each continent

A ranking by continents and individual banks may be seen in the following chart. The values on the right-hand side of the individual bars reflect the aggregated scores for criteria Tb-1 to Tb-5:

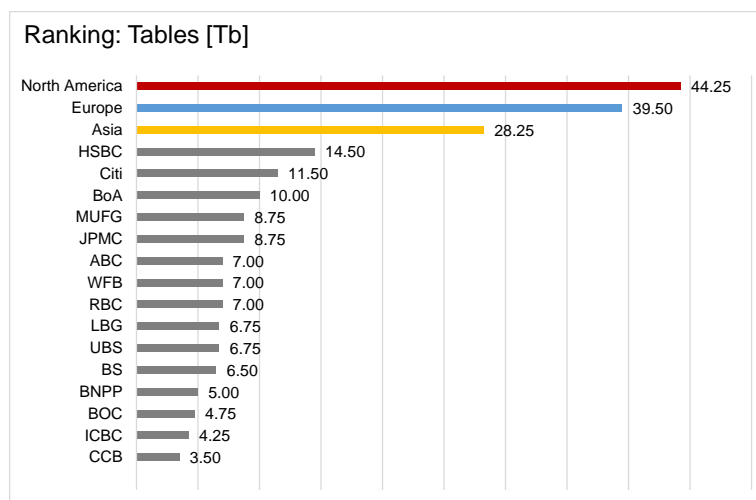


Figure 12: Ranking: Tables [Tb]

3.1.6 Colour coding (including barrier-free visualisations) [Co]

The findings for criterion group *Co* follow next.

¹⁹ ICBC, CCB, BOC and ABC share the last rank, as they all feature reverse column orders in their time-series tables.

²⁰ WFB, JPMC and BoA share the last rank, as they all feature reverse column orders in their time-series tables.

²¹ HSBC, BS and UBS share the first rank with correct column orders in their time-series tables.

²² CCB and ABC share the first rank with all texts being left-justified.

²³ ICBC, BOC and MUFG share the last rank with 0.20 tables on average presenting incorrect text alignment.

²⁴ WFB, JPMC, BoA and Citi share the first rank with all texts being left-justified.

²⁵ CCB and ABC share the last rank, as the figures in their tables are not right-justified.

²⁶ WFB, JPMC and BoA share the first rank with all figures in their tables being right-justified.

²⁷ All Asian banks did not visualise variances by means of relevant charts.

²⁸ All North American banks did not visualise variances by means of relevant charts.

²⁹ BS, LBG, BNPP and UBS did not visualise variances by means of relevant charts.

Across the entire sample, European banks rank first, followed by North American banks and Asian banks on the last rank.

On a consolidated basis, a mean (\bar{x}) of 6.12 colours could be attributed to every single colour (Co-1), with $\tilde{x} = 4.75$. For criterion Co-2, a low mean and median were found: on average, only 0.05 impacts were highlighted in the appropriate colours ($\tilde{x} = 0.00$). Lastly, from the analysis of criterion Co-3, it emerged that, on average, only 0.08 visualisations out of all analysed charts and tables used problematic colours that would render it difficult for readers with colour-vision impairments to discern the same.

In order to further illustrate criterion Co-3, a few bad examples found in the sample banks are shown below:

Normal vision	Vision with colour impairments
<i>LBG: chart 1 (p. 4)</i>	
<p>UK debt / GDP⁽¹⁾ (%)</p> <p>Total UK debt to GDP: 262%, 257%, 251%, 243%</p> <p>Q4 2007: 40</p> <p>Q4 2009, Q4 2011, Q4 2013, Q2 2015</p> <p>Household, Corporates, Public</p>	<p>UK debt / GDP⁽¹⁾ (%)</p> <p>Total UK debt to GDP: 262%, 257%, 251%, 243%</p> <p>Q4 2007: 40</p> <p>Q4 2009, Q4 2011, Q4 2013, Q2 2015</p> <p>Household, Corporates, Public</p>
→ For readers with a colour-vision impairment, it is practically impossible to distinguish the graph <i>Household</i> from the graph <i>Corporates</i> .	
<i>UBS, chart 34 (p. 15)</i>	
<p>Operating income</p> <p>CHF million</p> <p>931, 932, 938, 958, 913, 979, 952, 964, 915</p> <p>256, 234, 247, 267, 273, 284, 241, 238, 196</p> <p>540, 523, 541, 563, 557, 568, 560, 566, 576</p> <p>127, 144, 138, 140, 133, 134, 135, 136, 139</p> <p>Transaction-based, Net interest, Recurring net fee, Other, Credit loss (expense)/recovery</p>	<p>Operating income</p> <p>CHF million</p> <p>931, 932, 938, 958, 913, 979, 952, 964, 915</p> <p>256, 234, 247, 267, 273, 284, 241, 238, 196</p> <p>540, 523, 541, 563, 557, 568, 560, 566, 576</p> <p>127, 144, 138, 140, 133, 134, 135, 136, 139</p> <p>Transaction-based, Net interest, Recurring net fee, Other, Credit loss (expense)/recovery</p>
→ For readers with a colour-vision impairment, it is practically impossible to distinguish the category <i>Other</i> from the category <i>Credit loss (expense)/recovery</i> .	

Table 20: Examples of charts with hardly discernible colours in charts

A summary of the first and last ranks for each criterion Co-1 to Co-3 in each of the continents may be found on the following page:

Crite- rion	Asia			North America			Europe		
	First rank (\bar{x})	Last rank (\bar{x})	\bar{x} (\tilde{x})	First rank (\bar{x})	Last rank (\bar{x})	\bar{x} (\tilde{x})	First rank (\bar{x})	Last rank (\bar{x})	\bar{x} (\tilde{x})
Co-1	MUFG 4.57	ABC ■ 11.63	8.89 (9.33)	JPMC ■ 2.56	BoA 6.57	4.04 (3.71)	BNPP 2.83	LBG 10.20	5.42 (3.30)
Co-2	–	ex æquo ³⁰ ■ 0.00	0.00 (0.00)	Citi 0.06	ex æquo ³¹ ■ 0.00	0.01 (0.00)	LBG ■ 0.30	BS 0.06	0.13 (0.11)
Co-3	ex æquo ³² ■ 0.00	ABC ■ 0.61	0.16 (0.02)	ex æquo ³³ ■ 0.00	Citi 0.03	0.02 (0.02)	UBS 0.02	BNPP 0.17	0.07 (0.04)

■ = first rank

■ = last rank

Table 21: Colour coding [Co]: Summary of first and last ranks in each continent

The following chart illustrates the ranking by continents and individual banks. The values on the right-hand side of the individual bars reflect the aggregated scores for criteria Co-1 to Co-3:

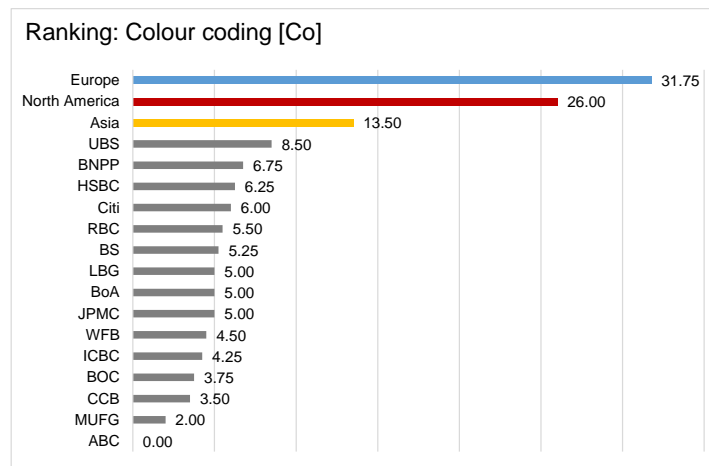


Figure 13: Ranking: Colour coding [Co]

3.1.7 Linguistic aspects [LA]

This section presents the results of the high-level analysis of criteria group *LA* (i.e. Linguistic aspects).

All banks considered, European banks are on the first rank, North American banks on the second and Asian banks on the third and last rank.

³⁰ All Asian banks rank last, as they either do not highlight negative, neutral and positive impacts in the correct colour or do not highlight them at all.

³¹ WFB, JPMC, BoA and RBC rank last, as they either do not highlight negative, neutral and positive impacts in the correct colour or do not highlight them at all.

³² ICBC and BOC share the first rank with no visualisation featuring problematic colours.

³³ BoA and RBC share the first rank with no visualisation featuring problematic colours.

For criterion LA-1, a mean of 0.71 ($\tilde{x} = 0.71$) simple sentences (in relation to all analysed sentences) was computed across the sample. Furthermore, on average, 0.13 orthographic errors were found per analysed page (LA-2), with \tilde{x} being 0.00. Lastly, 2.67 (\bar{x}) terminological inconsistencies were located on average in each results presentations ($\tilde{x} = 3.00$).

For the criteria LA-1, LA-2 and LA-3, the first and last ranks in each continent are listed below:

Crite- rion	Asia			North America			Europe		
	First rank (\bar{x})	Last rank (\bar{x})	\bar{x} (\tilde{x})	First rank (\bar{x})	Last rank (\bar{x})	\bar{x} (\tilde{x})	First rank (\bar{x})	Last rank (\bar{x})	\bar{x} (\tilde{x})
LA-1	CCB 0.82	ABC 0.33	0.55 (0.60)	JPMC 0.86	Citi 0.54	0.71 (0.68)	BNPP 0.98	LBG 0.71	0.86 (0.83)
LA-2	MUFG 0.07	BOC 1.25	0.40 (0.25)	ex æquo ³⁴ 0.00	RBC 0.03	0.01 (0.00)	ex æquo ³⁵ 0.00	–	0.00 (0.00)
LA-3	BOC 0.00	ex æquo ³⁶ 4.00	3.00 (4.00)	WFB 0.00	JPMC 6.00	3.20 (4.00)	ex æquo ³⁷ 0.00	BS 7.00	1.80 (0.00)

■ = first rank ■ = last rank

Table 22: Linguistic aspects [LA]: Summary of first and last ranks in each continent

A ranking by continents and individual banks is given below. The values on the right-hand side of the individual bars reflect the aggregated scores for criteria LA-1 to LA-3:

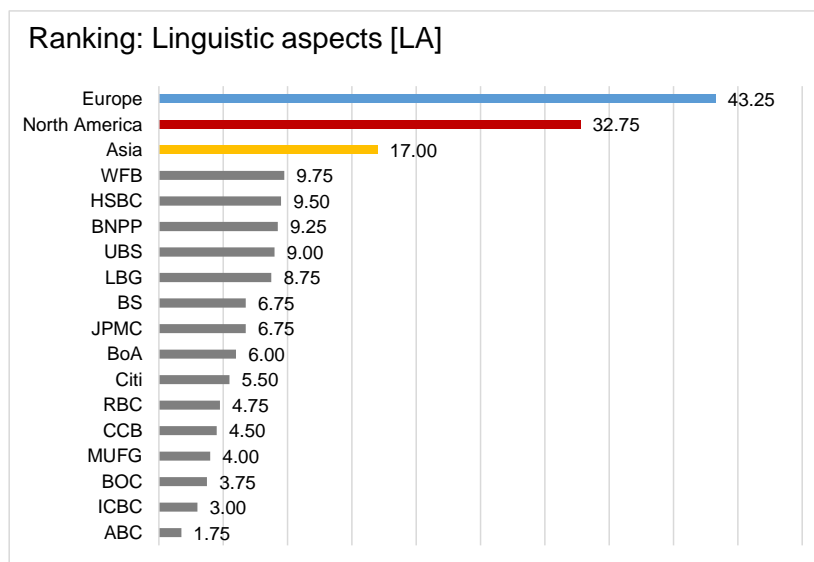


Figure 14: Ranking: Linguistic aspects [LA]

³⁴ WFB, JPMC, BoA and Citibank share the first rank with no orthographic errors.

³⁵ All European banks share the first rank with no orthographic errors.

³⁶ ICBC, ABC and MUFG share the last rank.

³⁷ HSBC, LBG and UBS share the first rank with no terminological inconsistencies.

3.1.8 Overall ranking

In this last section of the findings, the final scoring and overall ranking is provided for the entire sample.

The ranking is presented on the basis of both continents and individual banks. The values on the right-hand side of the individual bars reflect the aggregated scores for the continents and individual banks, respectively:

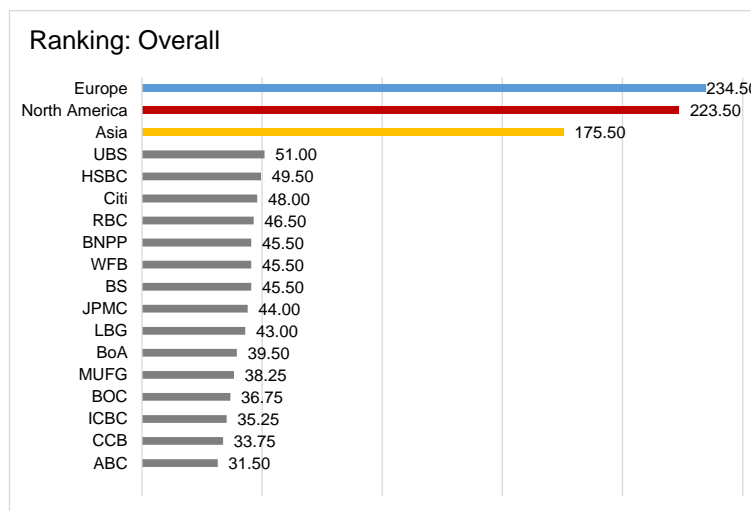


Figure 15: Ranking: Overall

As is apparent in the above chart, Europe meets the analysed criteria best, ranking first, with North America following closely. Asia, in turn, are at the bottom of the league table.

On the basis of individual banks, the European bank UBS ranks no. 1. The Swiss financial institute respected the analysed criteria best and thus ranked first in a large number of individual criteria, namely use of ISO 4217 currency codes ([IN-1](#)), consistent use of either point or comma as a decimal sign ([IN-4](#)), indication of negative values by means of preceding minus sign ("-") or parentheses ([OF-1](#)), chronological order for columns ([Tb-1](#)), orthography ([LA-2](#)) and terminological consistency ([LA-3](#)).

Conversely, ABC's results presentation is weak in many areas, ranking last with respect to the following criteria:

- Indication of negative values by means of parentheses or preceding minus sign ("–") [OF-1]
- Indication of positive values by means of a plus sign ("+") only in case of variances [OF-2]
- Distortions of information [Ch-4]
- Alignment of columns in chronological order [Tb-1]
- Alignment of figures [Tb-4]
- Variances visualised by means of appropriate charts [Tb-5]
- Colour coding (all criteria) [Co-1, Co-2 and Co-3]
- Readability [LA-1]

3.2 Discussion

3.2.1 Discussion of findings

Already upon leafing through the results presentations of the Asian banks in the sample, one may gain the impression that they are of inferior visualisation quality in comparison to their North American and European counterparts. The present study corroborates this impression – at least for the criteria that were analysed. Failing to respect these criteria may leave the readers with a bad impression of the banks in question. As already mentioned in chapter [3.1 Findings](#), the analysis revealed a number of weaknesses for Asian banks, which led to detractions in scoring. Firstly, in the Asian sub-sample, the signposting of negative and positive variances was often missing. This may be ascribed to the fact that, at least in some instances, the variances were preceded by arrows pointing up/down. The following screen captures are shown as examples:

CCB: table 1 (page 3)					ABC: table 1 (page 3)				
Key Financials					Key Financials				
RMB (billion)	31 December 2015	31 December 2014	Y-o-Y Chg		RMB100 MM	Dec 31, 2015	Dec 31, 2014	Y-o-Y Chg	
Total assets	18,349.5	16,744.1	+ 9.6%	↑	Total Assets	177,914	159,742	+ 11.4%	↑
Loans and advances to customers	10,485.1	9,474.5	+ 10.7%	↑	Loans and Advances	89,099	80,981	+ 10.0%	↑
Total liabilities	16,904.4	15,492.2	+ 9.1%	↑	Total Liabilities	165,795	149,415	+ 11.0%	↑
Deposits from customers	13,668.5	12,899.2	+ 6.0%	↑	Deposits	135,384	125,334	+ 8.0%	↑
Capital adequacy ratio	15.39%	14.86%	+ 0.53pps	↑	CET1 Capital Adequacy Ratio	10.24%	9.09%	+ 1.15 pps	↑
Net interest income	457.8	437.4	+ 4.7%	↑	NPL Ratio	2.39%	1.54%	+ 0.85 pps	↑
Net fee and commission income	113.5	108.5	+ 4.6%	↑	Provision Coverage	189%	287%	- 98 pps	↓
Net profit	228.9	228.2	+ 0.3%	↑	Net Interest Income	4,361	4,299	+ 1.5%	↑
Earnings per share	RMB0.91	RMB0.91	Even	↔	Net Interest Margin (NIM)	2.66%	2.92%	- 0.26 pps	↓
Cost to income ratio	27.02%	28.92%	- 1.9pps	↓	Net Fees and Commissions	825	801	+ 3.0%	↑
					Cost-to-income Ratio*	33.3%	34.6%	- 1.3 pps	↓
					Net Income	1,808	1,795	+ 0.7%	↑
					Basic EPS (RMB)	0.55	0.55	---	↔

Figure 16: Examples of inappropriate indications of negative and positive variances

In addition, Chinese banks uniformly used the abbreviation RMB (i.e. Renminbi), which may easily be confused with an ISO 4217 currency code. In reality, CNY is the correct ISO 4217 currency code assigned to the Chinese Yuan (SNV, 2015).

Secondly, for criteria group *Ch*, besides weaknesses in the choice of the correct charts types, low data densities and rather low direct labelling rates, the issues found with regard to distortions of information should be emphasised: not only do cut axes and incorrect scaling obstruct quick and effective comparison, they may also cause confusion and cast doubts as to the accuracy of the layout. The following two examples taken from the results presentations from ABC and MUFG, respectively, further illustrate this issue:

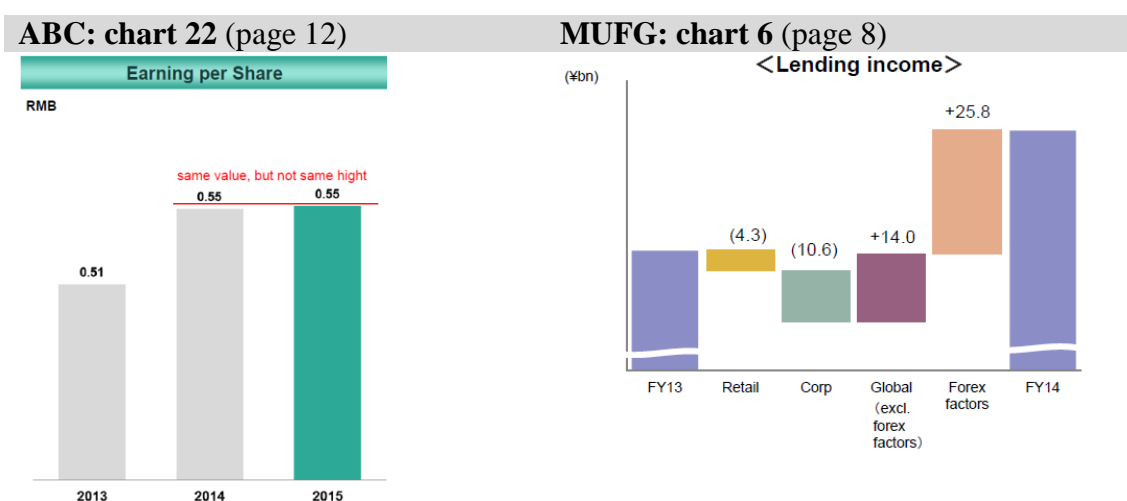


Figure 17: Examples of charts featuring distortions of information

Visualisations like the ones above do not correspond to scientific standards and should therefore be avoided in professional presentations whenever possible.

Issues were also found in tables: with the exception of MUFG, the Chinese banks all selected a reverse chronological column order for their time-series tables, which does not support the mental concept of time. The Asian sub-sample, besides ranking rather low in direct labelling and correct alignment of texts and figures, did not show any integrated visualisations of variances in tables by means of appropriate charts, which, if present, could have augmented information density according to Hichert & Faisst (2015, p. 67 ff.).

Another problematic area was the use of colours: throughout the results presentations, a given colour may carry multiple meanings. This issue is particularly pronounced

for ABC, which – presumably due to reasons pertinent to corporate design and corporate identity – predominantly used green in its charts. In addition, negative, neutral and positive impacts were not highlighted in the [predefined colours](#) or were not highlighted at all. CCB, for instance, used blue to highlight negative variances and orange to highlight both neutral and positive variances for their key financials. ABC, in turn, inverted green and red to indicate negative and positive changes, respectively (cf. [figure 16](#) above). To conclude the considerations for the colour-coding criteria, ABC and MUFG also revealed weaknesses in using discernible colours for readers with colour-vision impairments: as already outlined above, ABC used green in its charts and combines it with red, which may be problematic for readers suffering from deuteranopia; MUFG, on the other hand, used different shades of red and green, which are also suboptimal for people with colour-vision deficiencies. For illustration purposes, the following comparison shows how a reader suffering from deuteranopia would see the following chart taken from MUFG's results presentation:

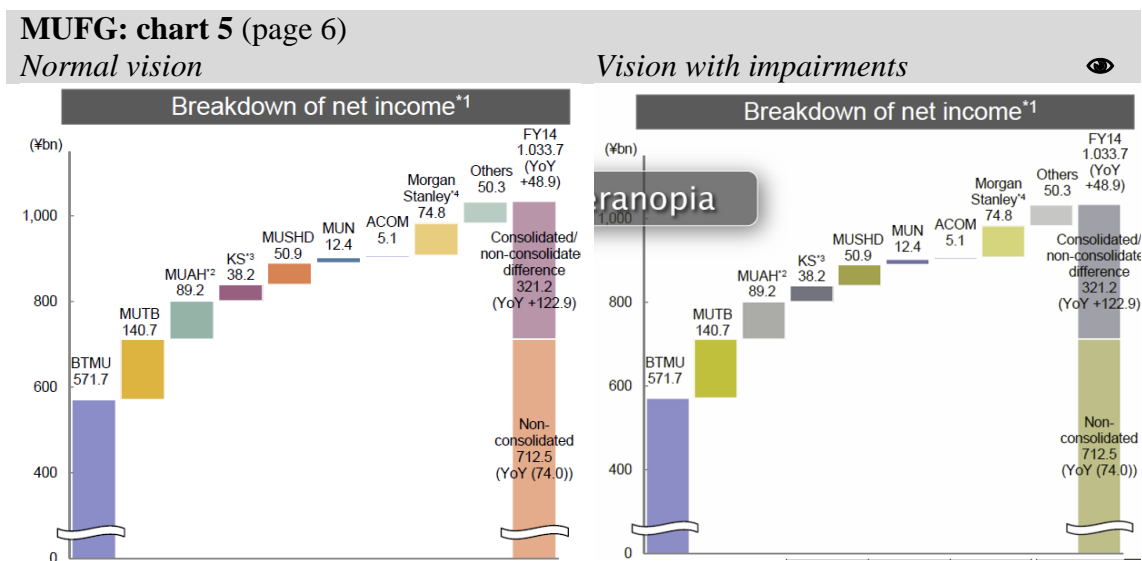


Figure 18: Selected charts as seen through the eyes of normal readers and readers suffering from deuteranopia

To conclude, medium to low readability results as well as an elevated number of orthographic errors was found in the Asian earnings presentations (in comparison to North American and European counterparts). Orthographic as well as typing errors, as the ones in the following examples, may have a negative impact on how professional the individual reader deems the relevant results presentation to be:


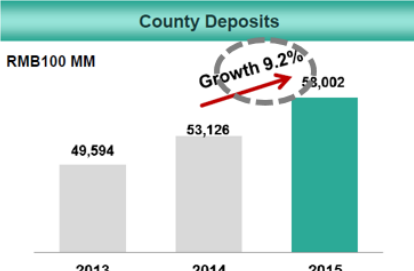
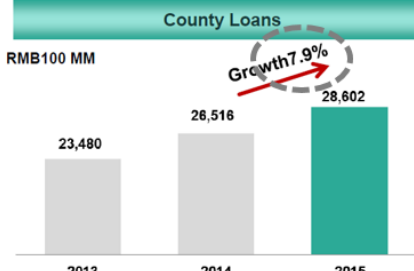
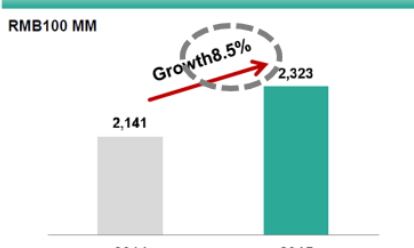
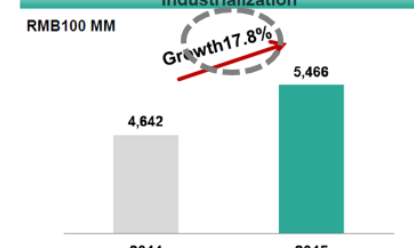
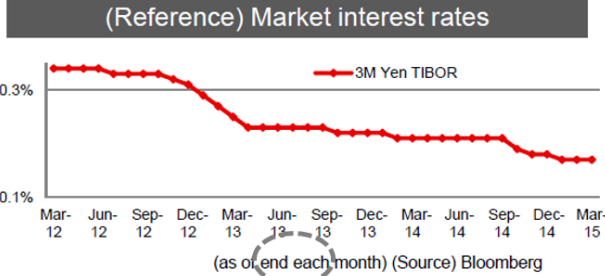
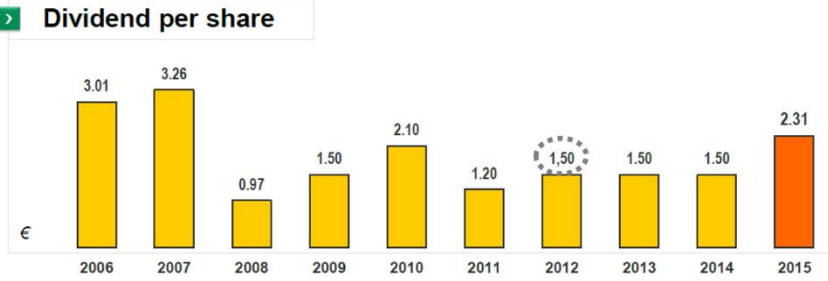
Bank	Examples
ICBC	<ul style="list-style-type: none"> Chart 2 (page 6)  Chart 7 (page 9) <ul style="list-style-type: none"> Mortgage 25,162 Consumption 3,111 Personal Business 2,951 Credit Card 4,195
ABC	<ul style="list-style-type: none"> Chart 29, 30, 31 and 32 (page 16) <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>County Deposits</p>  </div> <div style="text-align: center;"> <p>County Loans</p>  </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div style="text-align: center;"> <p>County Water Conservancy Construction Loans</p>  </div> <div style="text-align: center;"> <p>Loans for Leading Enterprises in Rural Industrialization</p>  </div> </div>
MUFG	<ul style="list-style-type: none"> Chart 11 (page 11) <div style="text-align: center;"> <p>(Reference) Market interest rates</p>  <p>(as of end each month) (Source) Bloomberg</p> </div> Page 19 <div style="background-color: #f00; padding: 10px; margin-top: 10px;"> <p style="text-align: center; color: white;">Historical outlook in Trust Assets (Consolidated)</p> <ul style="list-style-type: none"> Gross profits for FY14 progressed to ¥172.2 bn, increased by ¥12.5 bn from previous fiscal year Expansion of customers asset under management resulted in profit increase in each business section, pension, investment trust and global asset administration </div>

Table 23: Examples of charts featuring typing/orthographical errors

While the Asian sub-sample performed worse than the North American and European sub-samples, the Asian banks ranked first in the category *ISO norms (IN)*. In particular, they were found to be best at adopting the date format according to ISO-8601 (i.e. YYYY-MM-DD) (cf. [IN-5](#)). Nonetheless, this result may be merely a coincidence, given that Asian countries use YYYY-MM-DD as their default date format (Peters & al, 2013, p. 358).

While the Asian banks in the sample ranked last, the North American and European banks also presented problematic areas in their results presentations. Next, some selected considerations are offered for each criteria group.

The *ISO norms (IN)* postulated by the Hichert & Faisst (2015, p. 80 ff.) were not well observed throughout the sample. UBS is the only bank that consistently used ISO 4217 currency codes only. All other banks used either proprietary currency symbols (e.g. ¥, \$, €) or a mix of ISO 4217 currency codes and symbols. A high rate of non-observance was also found for the metric prefixes, which the Hichert & Faisst (2015, p. 81) suggests using along with the ISO 4217 currency codes. The use of a space as a thousand delimiter (ISO 80000-1) was not observed by any bank. Not even BNPP adopted this norm, despite the fact that the French typography prescribes the use of a space as a thousand separator (Cormier, 2007, p. 48). The complete non-observance of this ISO norm may be explained by the competition with the Anglo-Saxon comma as a thousand separator (Microsoft, 2016). Conversely, the consistent use of either a point or a comma as a decimal sign was fully observed by all banks, with the exception of BS and BNPP. The following two examples illustrate the inconsistencies:

Bank chart no.	Extract																						
BNPP: chart 20 (page 14)	 <table border="1" data-bbox="518 1579 1348 1859"> <caption>Dividend per share (€)</caption> <thead> <tr> <th>Year</th> <th>Dividend (€)</th> </tr> </thead> <tbody> <tr><td>2006</td><td>3.01</td></tr> <tr><td>2007</td><td>3.26</td></tr> <tr><td>2008</td><td>0.97</td></tr> <tr><td>2009</td><td>1.50</td></tr> <tr><td>2010</td><td>2.10</td></tr> <tr><td>2011</td><td>1.20</td></tr> <tr><td>2012</td><td>1.50</td></tr> <tr><td>2013</td><td>1.50</td></tr> <tr><td>2014</td><td>1.50</td></tr> <tr><td>2015</td><td>2.31</td></tr> </tbody> </table>	Year	Dividend (€)	2006	3.01	2007	3.26	2008	0.97	2009	1.50	2010	2.10	2011	1.20	2012	1.50	2013	1.50	2014	1.50	2015	2.31
Year	Dividend (€)																						
2006	3.01																						
2007	3.26																						
2008	0.97																						
2009	1.50																						
2010	2.10																						
2011	1.20																						
2012	1.50																						
2013	1.50																						
2014	1.50																						
2015	2.31																						

BS: table 2 (page 4)	ABS.	%
	2,642	8.9
	337	3.5
	2,978	7.6
	-318	-9.5
	2,660	6.2
	-1,532	7.6
	1,128	5.0
	454	-4.3
	1,219	12.5
750	12.9	

Table 24: Examples of charts featuring inconsistent use of decimal signs

The above errors may be due to simple carelessness; however, they may also reflect remnants of local, national standards regarding decimal signs. Lastly, as already mentioned above, Chinese banks were observed to be the only ones using ISO 8601 for the notation of dates. All other banks used other formats. As was already the case with the thousand separator, the date format also appears to be competing with well-established national standards. In summary, the question arises whether and to what extent such ISO norms could contribute to more clarity and efficiency if they are barely adopted in practice. Likewise, it should be questioned whether the adoption of ISO norms, competing with well-known national norms, could not even be the source of confusion. In addition, if such ISO norms exists, the question arises why software companies would still invest in software localisation³⁸.

As regards the criteria group *OF*, it was generally found that negative values were appropriately signalled. The same is not true for positive values: when indicating variances, they should be preceded by a plus sign ("+"). This suggestion was not adopted very well by the banks, probably because for normal purposes plain figures already reflect positive numbers.

Across all charts, it could be established that more than $\frac{3}{4}$ were of the correct type. The use of PCD charts is in part the cause for the remnant of incorrect chart types used. Data density is also rather medium-low across the banks: drawing conclusions as to possible causes would be speculative in nature. Nonetheless, charts with lower data densities could be a means of showing given results in a better light. The direct labelling rate of 0.67, on average, may appear high; however, appending direct labels to charts is relatively

³⁸ Software localisation represents "the process of adapting a software product to the linguistic, cultural and technical requirements of a target market." (SDL TranslationZone, 2016)

simple. It is therefore suboptimal that banks would still use separate legends, which cause superfluous eye movements. Likewise, the mean of 0.15 charts with distortions of information may seem low at first sight. Nonetheless, given that the relationship between customers and banks is based on trust and the latter highly rely on this particular relationship to conduct their business, one would expect that such distortions should not be found at all in the results presentations of financial institutions.

While the vast majority of charts supported the mental concept of time, the same was not the case for tables: 69% of all analysed tables featured a reverse chronological column order, which is in line with the [findings from the study conducted by the University of Applied Sciences Upper Austria \(FH OÖ\) in association with KMPG \(Eisl & al., 2015, p. 34\)](#). A possible explanation for this digression is that, unlike in charts, the current period may be highlighted in tables, offering an orientation to the readers. This, however, should not be regarded as a possible alternative to the traditional direction of reading, which runs from left to right. It is also noteworthy that both correct labelling and visualisation of variances in tables could and should be improved, although it is recognised that visualising changes in tables by means of charts requires more space.

In addition, it was noted that banks appear to be rather inconsistent in their use of colours: the impression gained during the analysis was that colours were, inter alia, motivated by guidelines of corporate identity and corporate design (hereinafter: *CD/CI*) rather than on perceptual considerations. The following doughnut chart taken from HSBC's results presentation shows a suboptimal use of a wide colour gamut:

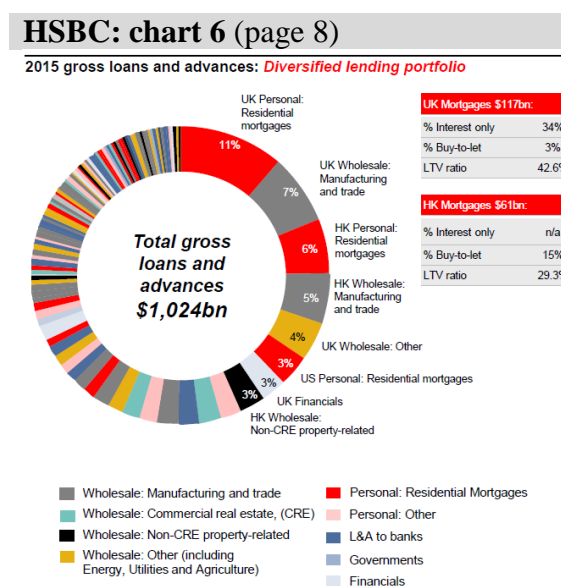


Figure 19: Example of a doughnut chart using a wide colour gamut

Likewise, CD/CI guidelines may interfere with the guidelines on barrier-free visualisations guaranteeing accessibility also to a minority of readers with colour-vision impairments.

To conclude, the analysis unveiled both typing and orthographic errors as well as terminological inconsistencies. In particular, it should be noted that the varying unit indications (e.g. *€ millions* vs etc.) and variable positioning of the same throughout a given presentation not only may be disorientating, but also may suggest that the presentation reflects a patchwork of single contributions lacking terminological specifications. The extracts below, taken from BS's results presentation, illustrate a set of inconsistent unit indications:

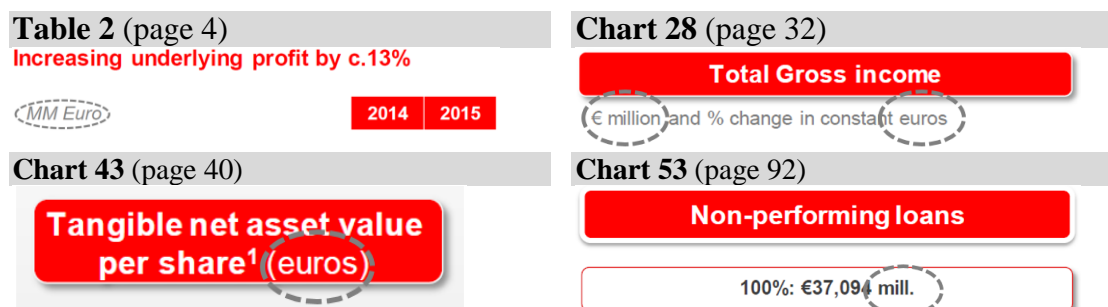


Figure 20: Examples of charts taken from BS's results presentations with varying unit indications and variable positioning of the same

3.2.2 Possible suggestions based on findings

Based on the previous findings, this section briefly discusses possible suggestions to address the issues outlined above.

Adopting ISO norms in results presentations, as postulated by Hichert & Faisst (2015, p. 80 ff.), certainly contributes to standardisation and unified messages. As a first step, however, it would be auspicious if banks defined their proprietary notation as well as terminology standards and ensured that they were uniformly adopted throughout each presentation. If several specialists contribute to a presentation, it would be advisable, too, if one person checked the presentation for consistency prior to it being published. Banks domiciled in countries where – contrary to Anglo-Saxon standards – a comma is used as a decimal sign, should pay particular attention not to confuse the Anglo-Saxon thousand delimiter and decimal sign with the counterpart from their own countries.

With respect to charts, credibility may be enhanced if the correct types were selected (which implies the avoidance of PCD charts). Furthermore, data density is augmented, for instance, by visualising data from several periods, rather than merely the current and the previous ones. Besides increasing data density, it would also enable better comparisons with the banks' own past. Lastly, it is deemed important that financial institutions refrain from distorting information: attention should be paid so as not to use truncated axes, clipped bars and columns, but most importantly to always opt for correct scaling. Incorrectly and/or diverging scaling, especially within the same chart, is almost immediately perceived and may raise suspicion and/or doubts.

What is already predominantly adopted for charts, should also be applied for tables: columns should be placed in chronological order so as to support the mental concept of time. If possible and space permitting, it would be beneficial if variances and changes were visualised by appropriate charts so as to improve information density.

Banks should furthermore formulate a colour concept that does not violate their own CD/CI guidelines, but also takes into consideration colour consistency and accessibility of their presentations for readers with colour-vision impairments. Lastly, it would be recommended that results presentations be proofread and checked for readability to support skimming and, thus, efficient information processing: using short, simple phrases/key words appears to be a suitable option.

4 Conclusion

4.1 Summary

This paper has investigated the efficiency and effectiveness of the leading five Asian, North American and European banks in terms of visualising charts and tables of results presentations. Another purpose of the current study was to explore differences in efficiency and effectiveness between presentations of banks from Western countries and Eastern countries.

The evidence from this study suggests that, with the exception of one criteria group, results presentations of Asian banks ranked last in comparison with their North American (rank no. 2) and European counterparts (rank no. 1). On a consolidated basis,

the Asian sub-sample revealed weaknesses in five out of six criteria groups. Major drawbacks were found to be low data densities and low direct labelling rates in charts, distortions of information by means of truncated axes, clipped bars and columns as well as questionable scaling. With regard to tables, four out of five Asian banks have predominantly adopted a reverse chronological order; issues were also located with the correct alignment of texts and figures. Lastly, readability was weak, with the presence of typing/orthographical errors.

The results of this study also indicate some shortcomings in the earnings presentations of North American and European banks, including: use of PCD charts, medium-low data densities in charts, medium direct labelling rate (DLR), information distortion in 15% of all analysed charts, use of reverse chronological order in tables, inconsistent and inappropriate use of both colours and terminology. In view of the high non-observance of ISO standards (e.g. date format), this paper has also raised the question of how and to what extent such ISO norms could contribute to increased clarity and efficiency.

4.2 Limitations of this research

In this part, selected limitations of the present study are briefly outlined.

4.2.1 Selection of criteria for analysis

Due to time constraints, only a small number of criteria out of a wide range of possible criteria was selected for the present study. Therefore, when reference was made to rankings in this paper, it was always made with respect to the selected criteria. Adopting other criteria and/or a wider range of criteria may lead to diverging results.

4.2.2 Period(s) analysed

In view of limited time, the present analysis only covered one period. Other results may have been obtained if the same analysis were conducted encompassing multiple periods.

4.2.3 Legal aspects, norms imposed by accounting standards and audit requirements

Legal aspects, norms imposed by the accounting standards adopted by the individual banks in the sample as well as audit requirements were not taken into consideration. As a result, it cannot be excluded that the criteria adopted for the present study are not in contravention with legal requirements and/or generally accepted accounting standards.

4.2.4 Number of pages analysed

Despite the effort to reduce the number of analysed pages, where necessary, it proved difficult to have the same range with respect to the number of analysed pages across all banks. Some results may thus have been diluted slightly for banks with longer results presentations.

4.2.5 No weighting of criteria groups

Another limitation of this study lies in the fact that no weights were conferred to the individual criteria groups in accordance with their importance. Likewise, the six criteria group contained different numbers of criteria.

4.2.6 Preferences of readers

Lastly, the actual preferences of the readers of such results presentations were not explored by means of surveys and/or oculometric tests.

4.3 Unresolved questions and suggestions for future research

This final section lists unresolved questions as well as possible areas of research for future studies.

4.3.1 Mental concept of time

The present study has shown that, in charts, the mental concept of time is well respected, which is less the case for tables. A further study could examine the reasons for this divergence, trying to establish why banks only digress from natural direction of reading when creating tables.

4.3.2 Effectiveness of ISO norms

As already mentioned, one of the findings to emerge from this study is that ISO norms had relatively high non-observance rates. Further research needs to be conducted in order to establish whether and to what extent such ISO norms contribute to enhanced clarity and efficiency. Oculometric tests with two groups could be carried out to examine the differences in information processing: two groups could be asked to answer the same questions. One group (i.e. control group) should be given a results presentation without data displayed according to ISO norms; the other group should be given the same results presentation, but with data displayed in line with ISO norms. The differences in answer quality and answer time could be used to assess whether ISO norms, besides standardisation, also contribute to enhanced clarity and information processing.

4.3.3 Conjoined studies with the Centre of Technical Communication of the Zurich University of Applied Sciences (ZHAW)

The scope of further studies in this area could be widened by conducting eye-tracking (oculometric) tests in the usability lab of the ZHAW School of Applied Linguistics. It would be also highly recommended that such studies be conducted in conjunction with the ZHAW Centre of Technical Communication, led by Prof Dr Catherine Badras, which may lead to further insights as to how banks may improve visualisation in results presentations.

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6 Appendix

1 Data CD including:

- a. Bachelor thesis in Portable Document Format (PDF)
- b. Sample:
 - Statista (2015). Leading banks worldwide as of April 2015, by market capitalization (in billion U.S. dollars) (PDF)
 - Statista (2015). Leading banks worldwide as of April 2015, by market capitalization (in billion U.S. dollars) (Excel file)
- c. 4Q 2015 (numbered/commented versions):
 - *Asia:*
 - ABC_Q4 2015
 - BOC_Q4 2015
 - CCB_Q4 2015
 - ICBC_Q4 2015
 - MUFG_FY 2014
 - *Europe:*
 - BNPP_Q4 2015
 - BS_Q4 2015
 - HSBC_Q4 2015
 - LBG_Q4 2015
 - UBS_Q4 2015
 - *North America:*
 - BoA_Q4 2015
 - CITI_Q4 2015
 - JPMC_Q4 2015
 - RBC_Q4 2015
 - WFB_Q4 2015
- d. Analysis files:
 - *Analysis_Master file.xlsx*
 - *Auxiliary files:*
 - 1_Analysis_ISO standards [IN].xlsx

- 2_Analysis_Other format suggestions [OF].xlsx
- 3_Analysis_Charts [Ch].xlsx
- 4_Analysis_Tables [Tb].xlsx
- 5_Analysis_Colour coding [Co].xlsx
- 6_Analysis_Linguistic aspects [LA].xlsx