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**Infusing Infographics into the Business Curriculum:
A Study of Infographic Interpretations in China, New Zealand, and the United States**

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Abstract

The present study sought to identify whether infographics should be infused into business curriculum as a tool for improving the efficiency of cross-cultural business communication. Students from the United States, New Zealand, and China were presented with a series of 10 infographics with all text in French, a language not spoken by any of the student participants. Of the infographics, eight were designed with traditional visual relationships, one was designed based upon metaphor, and one relied upon visual relationships and incorporated metaphor. The majority of students in both samples were able to successfully interpret the information in each infographic except for the infographic that relied upon a combination of visual relationships and metaphor. Additionally, the New Zealand students struggled with the Venn Diagram. As such, it is concluded that infographics should be taught as a business communication tool, but instructors should exercise caution in training students to use color metaphor or Venn Diagrams.

Keywords: *Infographics, Visual Communication, Business Curriculum, Business Communication*

As the workforce continues to become more globalized, universities are forced to adapt their curriculum to better prepare students for inevitable international business experience throughout their careers (Fall, Kelly, MacDonald, Primm, & Holms, 2013). While additional language and culture training are always a useful part of business curriculum, such training does not guarantee that students are prepared to communicate effectively cross-culturally. As Sandel (2017) explains, “Cultural practices and their associated meanings are not universal, and may appear...to be quite arbitrary” (p. 132). What may seem to be a universal business practice, such as greeting customers with a smile, upon closer examination may not. In Hong Kong a server’s smile is discouraged as it can be interpreted as “playing around” or “laughing” at a customer. Hence, “Culture serves as a framework for an individual’s actions, thoughts, and communication patterns” (Croucher et al., 2013, p. 20). Business communication training should challenge assumed universals and be attuned to the possibility of cross-cultural variability. This should include examining how communication tools are designed, including infographics.

Infographics are visual communication tools used to communicate complicated information, primarily data, in a straightforward visual way (Siricharoen, 2013; Smiciklas, 2012). Because 50% of the human brain is dedicated to either directly or indirectly processing visual information, humans are naturally inclined to understand visual representations of data more quickly than data explanations through words (Smiciklas, 2012). This means infographics allow individuals to understand data presented visually, that they otherwise would not be able to understand as an emic description due to linguistic or statistical literacy.

Because of the advantages of using infographics to communicate data, business scholars and professors have purported for years that business students are in desperate need of infographic training to prepare them for the global workforce (Kelly, 2015; Toth, 2013). Indeed, infographics are commonplace in the business workforce (Siricharoen, 2013). Yet, the assertions that business students need training in infographics have relied on logical argument and appeals to common sense (Kelly, 2015; Toth, 2013). At this point, no study has been conducted to assess the communicative power of infographics as a business communication tool. Therefore, this study intends to demonstrate the utility of infographics as a means of visually communicating data for the global business workforce.

Infographics

Durr (2014) suggests that “visual communication is much stronger than all of the other communication methods” (p. 40). Visual communication plays to the natural strengths of the human brain to recognize the relationship between shapes to create meaning. Infographics are a type of visual communication designed to take complicated data and present it in an easily digestible way (Durr, 2014; Kelly, 2015; Smiciklas, 2012; Siricharoen, 2013). Examples of common infographics include bar charts, pie charts, line charts, and Venn Diagrams.

Infographics rely on visual relationships and metaphor to create meaning (Smiciklas, 2012). To be effective, an infographic must be skillfully designed. They visually communicate information without the need for additional explanation (Toth, 2013), meaning infographics use minimal words. For this reason, the design of infographics is an interdisciplinary skill that requires high quantitative literacy and strong communication skills (Durr, 2014). Effective infographics

emphasize the most essential elements of a dataset (Davidson, 2014), those that are most important to the audience it is targeting (Chong, 2012). Yet, infographics can be built with little to no artistic ability (Smiciklas, 2012).

In the last five years, educators have touted the use of infographics in teaching because of the utility of infographics in explaining complicated material and in improving digital literacy (Matrix & Hodson, 2014), especially in science and mathematics (Sudakov, Belsky, Unsenyuk, & Polyakova, 2016). Davidson (2014) explains that infographics make science lectures more easily digestible and encourage student engagement. Mendenhall and Summers (2015) have found that teaching writing with infographics helps students think about the design of a paper. Further, Vanchansin (2013) found that using infographics in business lectures makes the material more digestible for business students. Toth (2013) also adds that forcing business students to design infographics helps identify information literacy concerns for business students as professors watch them decide what information is needed to build the infographic, find the information, evaluate the information, then use the information to effectively and ethically communicate.

Infographics are also recommended for sharing information outside of the classroom. Turck, Silva, Tremblay, and Sachse (2014) recommend that physicians use infographics to explain health information to their patients. Scott, Fawkner, Oliverly, and Murray (2016) additionally recommend infographics as an effective way to explain medical information across literacies. Infographics are also used widely and frequently in public relations as businesses share their products and goals with stakeholders (Gallicano, Ekachai, & Freberg, 2014).

Rationale

Despite the prevalence of chart-type infographics in business such as bar charts and line charts as well as the many benefits of infographics in information sharing, there is only anecdotal evidence that infographics are beneficial for business. Given the increasing globalization of the business world, the utilization of communicative tools that overcome language barriers could be a great benefit. Therefore, this study will identify whether infographics can indeed span language barriers. Specifically, the following research question will be addressed:

Research Question: To what extent can students interpret useful information from infographics when all text is in a foreign language?

Infographics that rely on spatial relationships are designed to benefit from shared functionality of the human brain that should span literacy abilities across cultures (Smiciklas, 2012). Infographics that rely upon metaphor, that which is often specific to a culture, may not be as adept at communicating cross culturally. Therefore, the use of metaphor may depend upon the global prevalence of the metaphor. For this reason, this study will include two infographics that rely on metaphor. One infographic will rely on the well-known visual metaphor of a pyramid and the other will utilize color metaphor, which is typically used as an enhancement to chart infographics in business. Specifically, traffic light colors that utilize green for good information, yellow for information that has the potential to become good or bad, and red for bad information is a common addition to business charts in the U.S. (Smiciklas, 2012).

While red is often associated with loss or warning in the U.S., in China the color red may be used to indicate a gain or profit: for example, in reported stock market prices an upmarket is indicated by the color red (Kramer & Block, 2007). This is not the case, however, in all parts of greater China: In Hong Kong, a former British colony, green is commonly used to represent a movement upward, such as the stock market or directional signs, and red for a downward movement (Jiang et al., 2014). The use of green to indicate stock market gain is also commonly used in the United States and New Zealand. Evidence to support different meanings associated with the color red for Hong Kong, Mainland Chinese, and U.S. populations was found by Chan and Courtney (2001). They found the U.S. sample was most likely to associate the color red with the concepts of stop and danger, while Hong Kong and Mainland Chinese populations were less likely to associate red with these concepts. The sample for the current study will include participants from the U.S., New Zealand, and China. The Chinese university where data for this study were collected is in a part of China known as the Pearl River Delta area, encompassing Hong Kong, Macao, and the major cities of Guangdong Province--Guangzhou, Shenzhen, and Dongguan. Therefore, the Chinese participants were exposed to media from across the region, including Hong Kong and Mainland China. Therefore, the following hypothesis is proposed:

Hypothesis: While participants from U.S. and New Zealand will be unified in their interpretation of the infographic which utilizes red and green color metaphor, participants from China will have differing interpretations.

Method

Subjects. A total of 338 students participated in this study. To represent a diverse group of students, the participants consisted of $n = 105$ students from a U.S. university, $n = 111$ students from a New Zealand university, and $n = 122$ students from a Chinese university. Demographic information is summarized in Table 1.

		USA	New Zealand	China
Total		105	111	122
Sex	Males	47	51	46
	Females	58	60	76
Average Age		20.08 ($SD = 1.55$)	21.30 ($SD = 3.15$)	19.42 ($SD = 1.40$)
Year in School	Freshmen	3	35	62
	Sophomores	39	30	12
	Juniors	42	18	32
	Seniors	21	28	16

Table 1: *Demographics*

Procedure. Students in each sample were presented with a series of 10 infographics in which all text was in French, a language not native to any of the countries represented in this study. They were also presented with one question to answer per infographic. These infographics and the questions can be seen in the appendix. The method of participant solicitation and data collection differed slightly by country though all participants saw the infographics in the same order.

United States. In the U.S., students were presented with a questionnaire composed of the items accompanying the infographics in the appendix. The questionnaires were distributed in a mass lecture hall during a business communication course on the day in which communicating data was discussed. There were 107 students in attendance for this business communication course. Students were required to complete the questionnaire as it was part of the day's activities in demonstrating the utility of infographics. However, students were given the option of keeping the questionnaire when they left the room or handing it to a TA if they were willing to let their data be used in this study. All students returned the questionnaire to the TA. Data from two students were discarded because they indicated in their responses that they have French language training, and therefore had an unfair advantage completing the activity. Students were shown the slides one at a time on a projection screen and asked to answer the corresponding question on the questionnaire. In total, the activity took approximately 10 minutes.

New Zealand. In New Zealand, students were presented with the questionnaire in four communication/media courses on the day in which branding was discussed. Data collection was conducted by staff responsible for teaching the individual courses. Students were informed that their participation was entirely voluntary. The staff members displayed the slides on a projection screen for students one at a time. The data relevant to this study were transcribed into SPSS by the staff member to protect students' anonymity. The data were then delivered to a researcher. No data were lost because of French fluency.

China. The survey was distributed by a researcher to students in China at a university where English is the medium of instruction for most programs. However, since English is not the first language of the majority of students, both the informed consent statement and questions were translated into Chinese by a native Chinese speaker. Questionnaires were distributed to students in four separate classes, enrolling a total of 150 students. Because some students were enrolled in two or more of these classes, the total number of surveys distributed was 130. Furthermore, responses given by five exchange students from a French-speaking country were not included, and three students entered incomplete data. This yielded a total of 122 valid questionnaires. The questionnaire was distributed at the beginning of each class; the researcher explained that students were not required to participate. The researcher explained that in the infographic images they were about to see, the text was deliberately written in French, a language they did not understand. Participants were then shown the ten slides on a projector. Because some of the students attempted to ask their classmates for help to answer the questions, the researcher then instructed students to not ask for assistance, emphasizing that they should select an answer based upon their best understanding of the infographic.

Instrumentation. Ten infographics were designed as induction material with all text in French as well as an accompanying questionnaire, which asked one question per infographic (see the appendix). French was chosen for the text because it is not an official or common language of any of the countries in which participants were recruited but is spoken by one of the researchers who could verify translation. Students in the U.S. and New Zealand received the informed consent and questionnaire in only English while the Chinese students received the questionnaire and informed consent in English with the Chinese translation accompanying. The question for each infographic asked students to identify the information Smiciklas (2012) identified as the intended deliverable for each type of infographic. Among these infographics, five were basic chart-type

infographics identified as common business infographics: a donut chart (1), a vertical bar chart (2), a pie chart (5), a horizontal bar chart (6), and a line chart (8) (Siricharoen, 2013; Smiciklas, 2012). (The numbers in parentheses by each infographic listed correspond to the number of the infographic as it appears in the appendix.) A map infographic (9) and Venn Diagram (3) were also included as they are considered to be two of the most classic infographics that rely on visual relationships (Siricharoen, 2013, Smiciklas, 2012). Next, a popular infographic relying on solely metaphor was chosen [pyramid structure (7)]. A process chart, which is a common instructional infographic (10), was included (Smiciklas, 2012). Last, a chart-type infographic (4) was designed with both a visual relationship and color metaphor as described in the rationale. After the infographics were designed, they were arranged in a random order so that design types were not clumped together.

Results

The results are shown in Table 2. The columns display not only the percentage of correct answers per infographic by country, but also percentage of correct answers that could be expected by chance alone. For 8 of 10 infographics, participants in each of the three samples selected the correct answer far more frequently than could be expected by chance.

	Percent Correct			Probability of Guessing Correctly
	United States	New Zealand	China	
Infographic 1	92.4%	82.0%	69.7%	25%
Infographic 2	98.1%	82.9%	94.3%	25%
Infographic 3	95.2%	15.3%	91.8%	25%
Infographic 4	14.3%	39.6%	13.9%	25%
Infographic 5	97.1%	76.6%	86.1%	25%
Infographic 6	96.2%	91.0%	100%	20%
Infographic 7	93.3%	79.3%	97.5%	33%
Infographic 8	100%	88.3%	97.5%	50%
Infographic 9	99.0%	77.5%	86.1%	50%
Infographic 10	98.1%	86.5%	95.9%	25%

Table 2: *Results*

The one instance in which there was variance the results was for Infographic 3, the Venn Diagram. For Infographic 3, most U.S. and Chinese students selected the correct answer, but most New Zealand students did not. In fact, fewer students chose the correct answer in the New Zealand sample than would be expected by even chance, indicating there must have been an intentional rationale behind selecting at least one other answer.

The most notable data are associated with Infographic 4, which is the infographic connected to the hypothesis. Again, this line chart was designed based upon visual relationship, but participants had to associate meaning with the colors of the lines through metaphor to accurately interpret the data. The hypothesis predicted that the meaning would be clear to both U.S. and New Zealand students, but that Chinese students would be varied in their interpretation.

However, the data showed that Infographic 4 was problematic for students across all three samples.

Discussion

Students from the U.S., New Zealand, and China were able to accurately glean information from 8 of the 10 infographics far more often than can be accounted for by chance. Among these well interpreted infographics were a donut chart, a vertical bar chart, a horizontal bar chart, a pie chart, and a line chart, all of which are commonly used in business (Siricharoen, 2013). Students also accurately interpreted information from the pyramid chart, map chart, and flow chart.

Interestingly, the majority of the New Zealand sample struggled with the Venn Diagram while the majority of U.S. and Chinese participants accurately interpreted the meaning. In fact, 74.8% of New Zealand participants chose “Analyse” as their answer, which was the only answer in the “Quantitatif” circle of the Venn Diagram. It seems that their focus in using this chart was to look for something that stood apart rather than overlapped. As such, a Venn Diagram may not be a good infographic to use cross culturally.

The only infographic that seemed to cause universal confusion was Infographic 4, which was a line chart that utilized color metaphor. Without speaking French, participants’ only clue as to which line represented sales vs. products returned in this infographic was the color of the lines. The correct answer for the question associated with Infographic 4 was 2015. Among the New Zealand sample, more participants identified the correct answer for Infographic 4 than expected by chance, yet more respondents than predicted by chance also chose 2016 in this sample, meaning that there is likely a rationale behind both choices. Interestingly 2016 was also the most common answer for the U.S. (81.9%) and Chinese samples (75.5%). It is not surprising that most Chinese participants chose 2016 as the correct answer because this year has the lowest dip on the graph for the red line, the line Chinese participants are most likely to associate with financial prosperity. Notably, 2016 had the lowest dip of any data point in Infographic 4 for either line, which means the majority of the participants may have relied upon visual relations alone to make meaning in this graph. Overall, this reliance on color metaphor within a standard chart seems to be a risky design choice for an international sample who cannot be assisted by labels accompanying color choice.

Notably, all samples interpreted the metaphor of a pyramid in Infographic 7 well. This indicates that metaphor can still be useful in presenting data cross culturally. What is not clear from the present study is whether respondents defaulted to interpreting data in Infographic 4 based on visual relationships without considering color metaphor or whether the color metaphor truly held unclear meaning for participants. Indeed, this study is not without limitations. This quantitative approach to understanding infographics clearly identified material that caused misunderstandings, but did not provide opportunities to understand why or how particular infographics were misunderstood. Additionally, a design flaw in Infographic 4 was not noticed until the data were collected. Infographic 4 has its lowest data point represented by the red line. This made it impossible to know whether the Chinese participants were answering according to color metaphor or simply choosing the lowest data point on the chart as suspected of the U.S. and many New Zealand participants. A more effective design of this infographic would have had the universally lowest data point reached by both the green and red lines in separate years.

It is particularly noteworthy that the U.S. sample performed well on 90% of the items. Students in the U.S. have been noted to struggle greatly with quantitative literacy as a result of prevalent quantitative reasoning anxiety, especially when compared to Chinese students (Kelly, Rice, Wyatt, Ducking, & Denton, 2015; Kelly, Liu, Denton, Lee, & Croucher, 2018). Because the U.S. sample performed relatively as well as the Chinese sample in this activity, this may indicate that infographics do not induce quantitative reasoning anxiety among U.S. students like other data interpretation activities that focus on numbers rather than visuals.

Implications for Instructors

In short, the data demonstrate that infographics have the power to communicate data across languages. This evidence supports the claims previously made by scholars (Kelly, 2015; Toth, 2013) that infographic design should be incorporated into business curriculum. Therefore, this manuscript will conclude with suggestions for incorporating infographics into business curriculum.

Communication, Not Art. Infographics are a visual communication medium, not works of art (Smiciklas, 2012). Anxiety can be one of the greatest detriments to students' ability to work efficiently on course material (Kelly et al., 2015). As such, students who are not artistically gifted may create unnecessary anxiety for themselves if they think of infographics as works of art (Smiciklas, 2012). Therefore, an instructors' first job when teaching infographics is to make it clear to all students that they are producing clear, efficient messages, not art pieces.

Infographic, Not Info with Graphics. The term "infographic" is often misused in popular media to describe any information shared with minimal wording and images. Therefore, many students have misconceptions about what constitutes an infographic. It is important to teach students the distinction between an infographic, which relies on visualization to communicate their message and information accompanied by visuals. Students must be reminded that if they can take the visual components out of any "infographic" and still understand the message, then the composition simply is not an infographic because the information is shared with words, not the visuals. When introducing infographics, instructors should consider incorporating an activity that requires students to identify whether or not compositions constitute an infographic.

Integrating Infographics into Business Communication Curriculum. Infographics can be easily introduced into a standard business communication course by having students transform their traditional résumés into infographic résumés (Kelly, 2015). Designing infographic résumés not only challenges students' critical thinking skills, it also produces eye-catching options to hand out at career fairs. These well designed, visually stimulating infographic résumés are especially useful for business majors in technology-focused degrees such as business information technology or management information systems, who need to demonstrate their technology skills to employers, not just claim that the skills exist.

Infographics are also easily incorporated into Report Writing and Presentations courses. As students work in these courses to develop their oral and written communication skills, they can also have opportunities to develop their visual communication skills. Any data-based report or

presentation can include an infographic component without the addition of new source or instructional material.

Conclusion

In summary, the data collected in the present study indicate that infographics are effective visual communication tools that can be used to simplify cross-cultural business communication. Yet, the data indicate that in preparation for an international audience, instructors may be wise to train students not to rely upon color metaphor to hold unique information when building infographics. Rather, visual relationships and well-known metaphors appear to be more reliable design choices. Instructors of business communication or reports and presentation courses are encouraged to consider including infographics in their communication curriculum.

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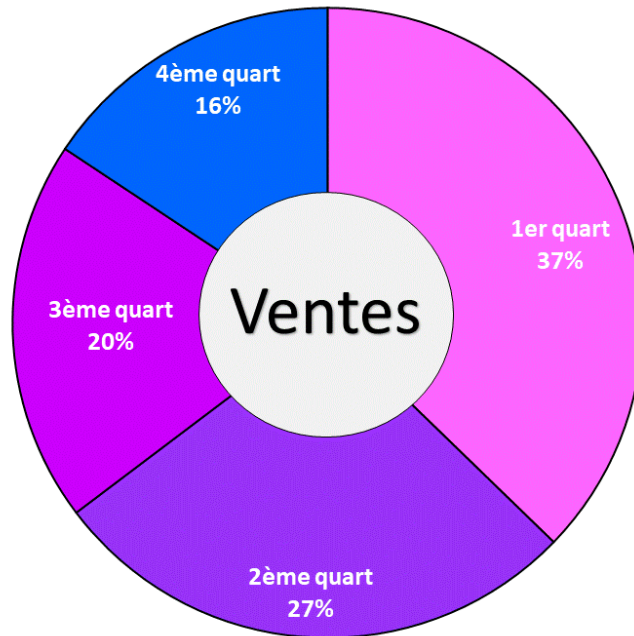
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Appendix of Infographic Items

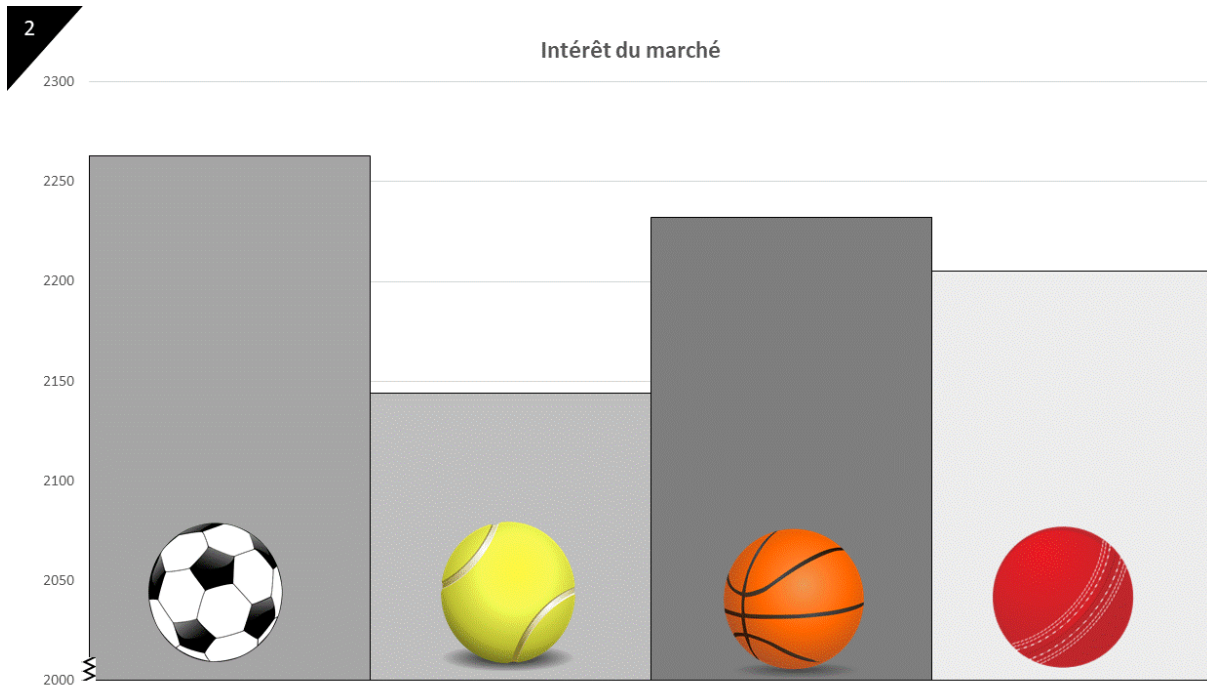
1



1. Which quarter had the best performance?

以下哪一部分表現得最好？

- a. 1st
- b. 2nd
- c. 3rd
- d. 4th

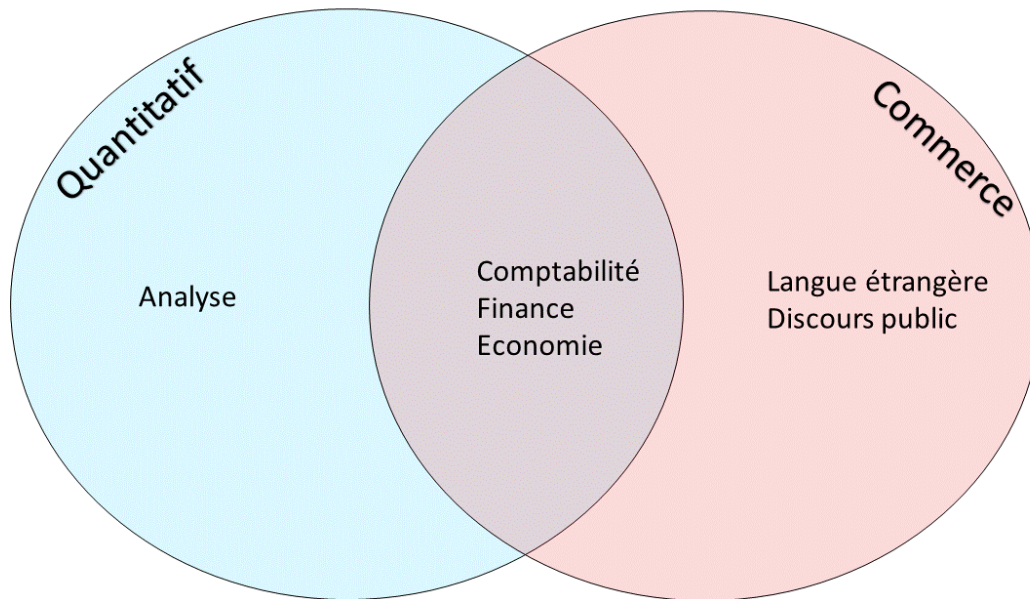


2. Which sport is the most popular?

以下哪種運動是最受歡迎的？

- a. Soccer
- b. Tennis
- c. Basketball
- d. Cricket

Connaissances préalables

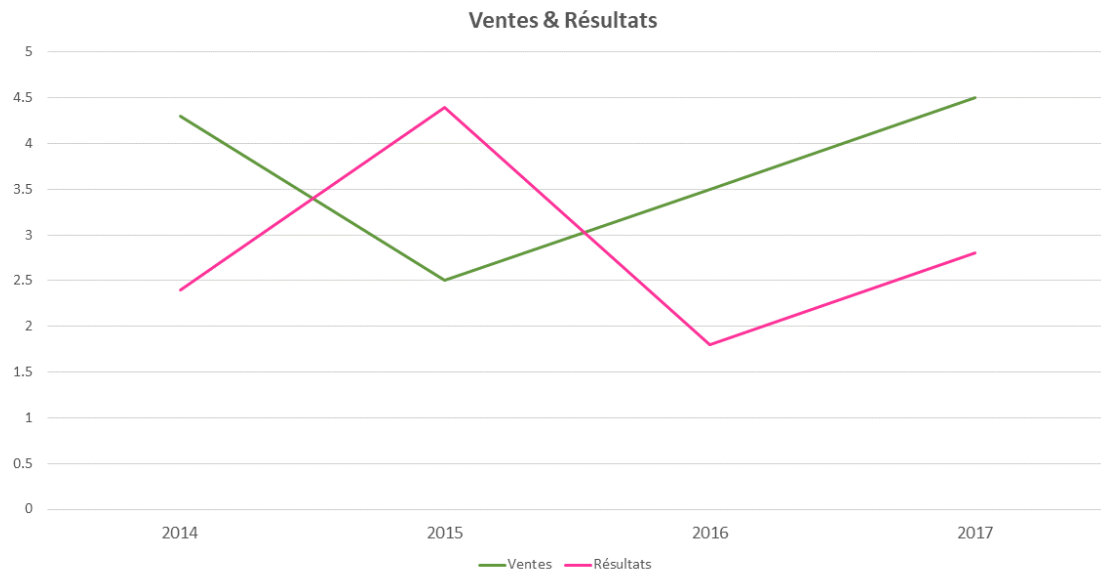


3. Which of the following skills is both quantitative and business?

以下選項中，哪項技能既是量化技能，又是商業技能？

- a. Analyse
- b. Langue étrangère
- c. Discours public
- d. Comptabilité

4

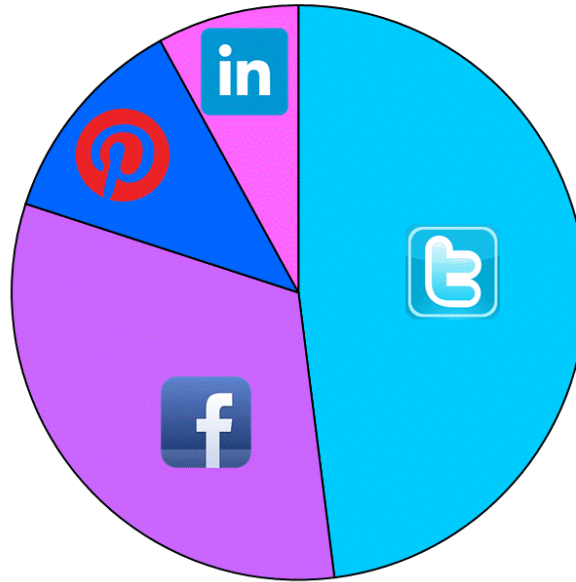


4. Which year was the worst financially?

以下哪一年是經濟上最差的一年？

- a. 2014
- b. 2015
- c. 2016
- d. 2017

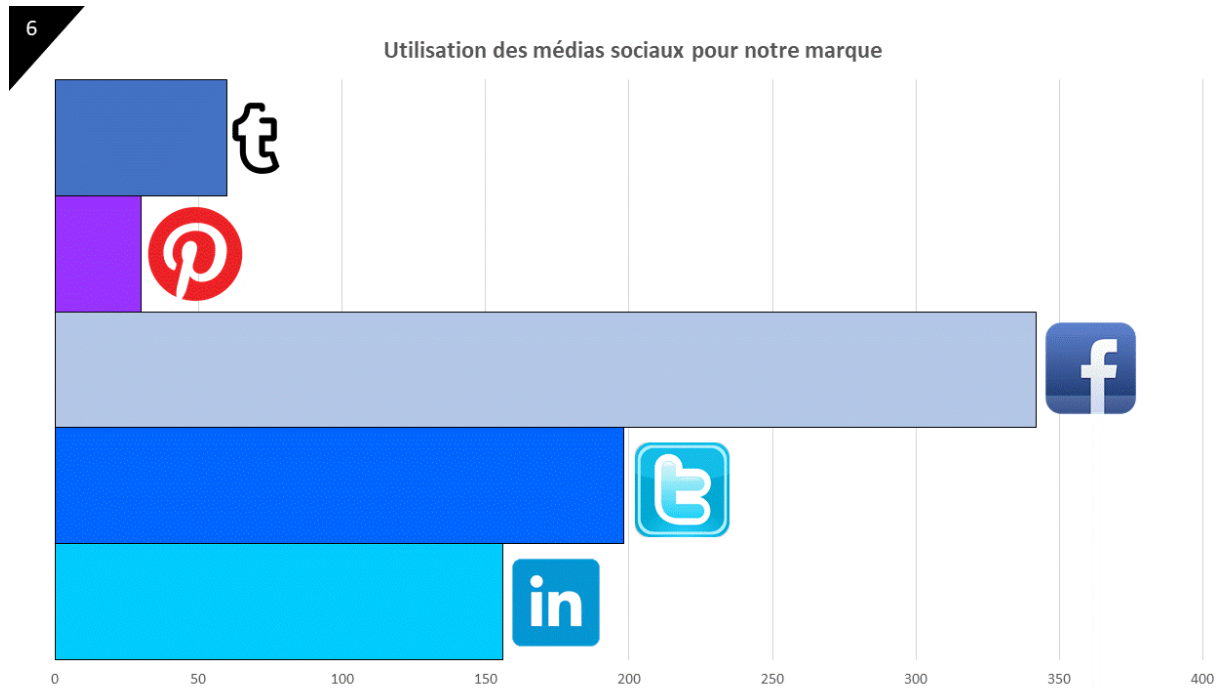
Utilisation des médias sociaux



5. Which social media platform yielded the least traffic?

以下哪個社交平台產生的流量最少？

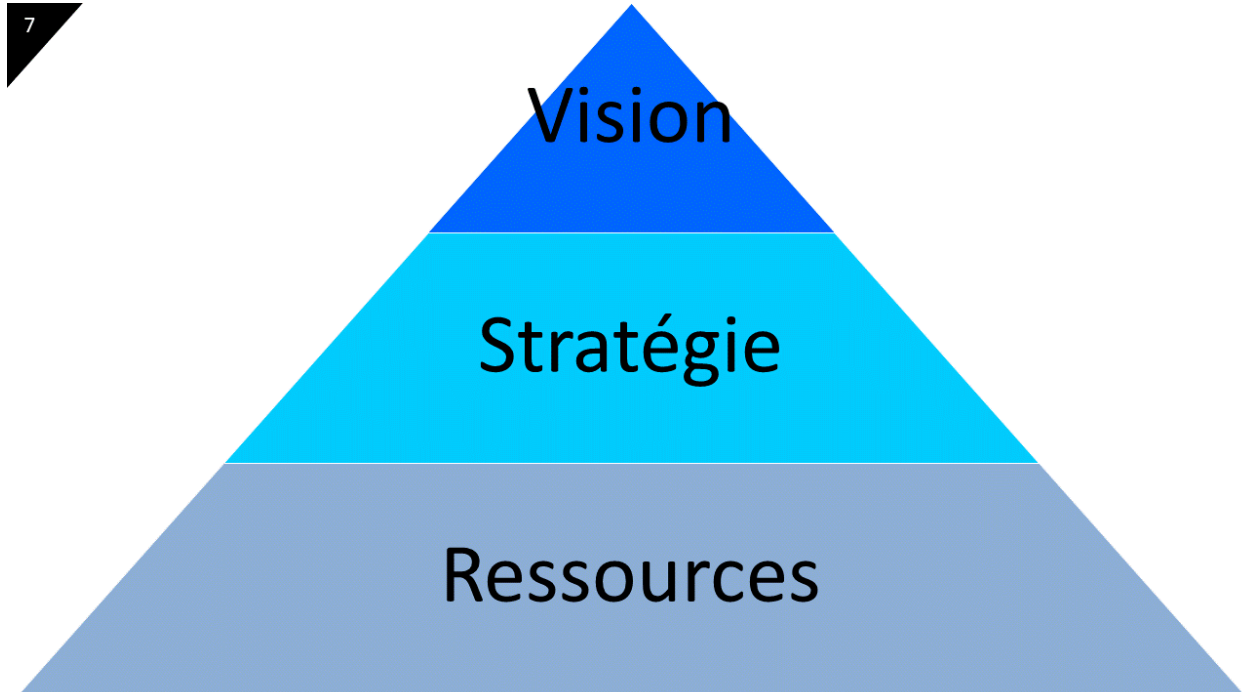
- a. LinkedIn
- b. Pinterest
- c. Facebook
- d. Twitter



6. Which social media platform has yielded most traffic?

以下哪個社交平台產生的流量最多？

- a. Tumblr
- b. Pinterest
- c. Facebook
- d. Twitter
- e. LinkedIn

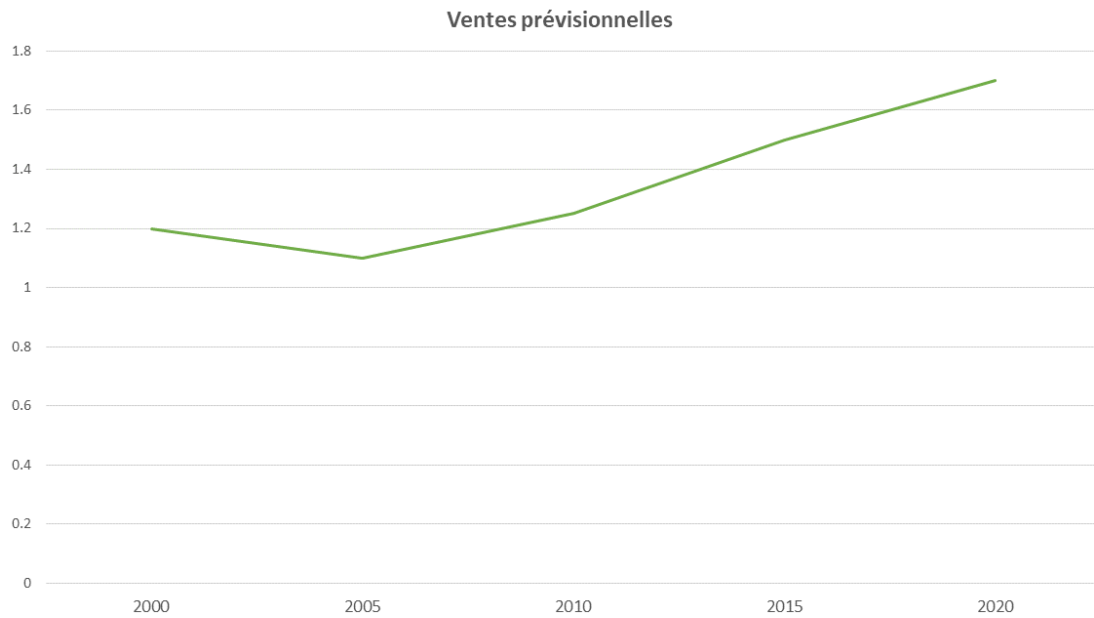


7. Which goal is the foundation for the other goals?

以下哪個目標是其他目標的基礎？

- a. Vision
- b. Stratégie
- c. Ressources

8



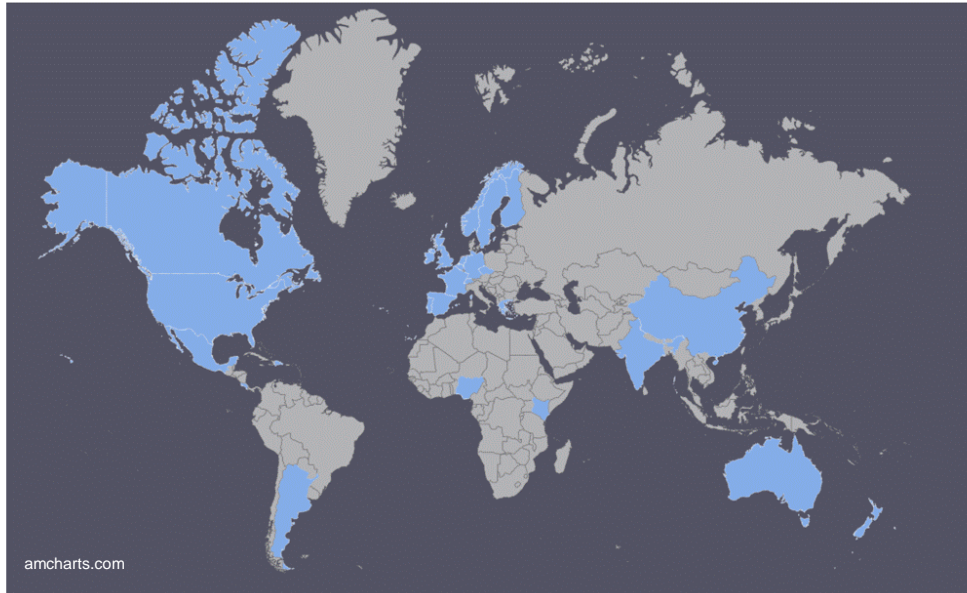
8. Sales for 2020 are expected to be ____ than for this year:

據預測，2020年的銷售量要比今年的銷售量更____

- a. Higher
- b. Lower

9

Zones de couverture

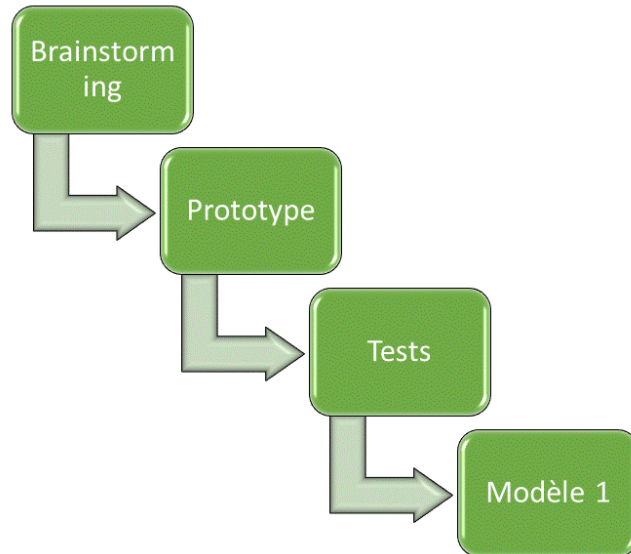


9. Is Australia included in this coverage area?

圖中覆蓋的區域包括澳大利亞嗎？

- a. Yes
- b. No

Phases de conception



10. What is the third step in this process?

這個過程中的第三步是什麼？

- a. Brainstorming
- b. Prototype
- c. Tests
- d. Modèle 1