Solution Series 1

1. a) A retail store is analysing the buying patterns of its customer.

    1. Descriptive analytics
    2. Questions could be:
        - Which customers are buying what products and when (during the day, weekday, season, etc) they are buying these products?
        - Are there certain baskets i.e. products which are bought together by the customers?
        - Are the customers buying more products with sales discounts than they would do without a discount?
    3. Pie diagrams, bar plots, scatterplots, time series plots, tables with percentages, mean, median, quantiles, and so on

    b) An industry company is building up a new manufacturing plant. During the planning phase an optimised allocation of production processes as well as process steps has set up which determines the implementation of the manufacturing plant. One has to consider the different production step, the material used as well as the required skills of the workers.

    1. Prescriptive analytics (descriptive analytics & predictive analytics)
    2. Questions could be:
    a) What is the optimized outcome of an allocation?
    b) What is the second best outcome of an allocation?
    c) What would happen if we arrange the production processes in another way?
    d) What would happen if a certain production machine would fail in the process?
    e) What would happen if we have a high production demand?
    f) What would happen if we would change production material?
    3. First for the input parameter: descriptive analytics. Predictive analytics if market trends has to be determined, times series analyses and finally, clustering methods (cluster algorithms) and optimisation methods e.g. Operations Research are used.

    c) A bank has to report to the regulator on a regular basis the number of employees who have traded own financial instruments within a restricted trading period. They should report it by function and business area.
    1. Descriptive analytics (reporting)
    2. Questions could be:
        - How many employees, by business area, and by business function have traded financial instruments within a restricted trading period?
        - How many have traded just before the restricted period?
    3. Pie diagrams, bar plots, scatterplots, time series plots, tables with percentages.

d) A company is producing and selling elevators and additionally, the company sells the maintenance of the elevators as a service contract over a certain time period for a fixed price. If the maintenance takes place too late, and there is a breakdown of the elevator, the costs for repairing it a very high and higher than the fixed price. Thus, based on the experience with their elevators they want to determine the time point when a maintenance should take place.

1. Predictive analytics and prescriptive analytics
2. Questions could be:
   - When takes the next failure of an elevator place?
   - Why this breakdown happen?
   - What are influencing factors causing a breakdown?
   - When has the maintenance to take place?
3. Descriptive analytics for the as is statistics i.e. diagrams, bar plots, scatterplots, time series plots, mean, median, deviations per type of elevator, possible influencing factors and so on. Survival analysis to predict the next breakdown. Predictive: running scenarios e.g. Monte Carlo simulation for determining the best time point for a maintenance and which maintenance.

e) An insurance company wants to test different marketing campaigns and marketing media (e-mail, advertisement, etc.) against each other.

1. Prescriptive analytics
2. Questions could be:
   - Which potential customers have to be contacted with what product and which media at what time point?
   - Which customers we do not have to contact? (because they do not buy anything at all)
   - Which customer maybe want to change their product e.g. afkustment of the sum assured?
3. Set up a proper test and control design and performing statistical tests

2. The 5 Ws:
   a) Stakeholders:
      - Swiss management (CEO, CFO, marketing responsible): direct stakeholder, they are sponsoring the project and are the decision makers
      - Parent company: direct stakeholder, forced the CEO to take action, the annual assembly will look and judge about the results of the actions
      - IT People: direct stakeholder, they have to provide data to you and further information, they maybe have also to implement certain actions
      - Staff: direct stakeholder, because they are most probably also interviewed and finally affected by the actions even they will maybe not have any direct decision influencing position
      - Customer: indirect stakeholder, are affected by the actions but are not included in the actions nor decision process of the project
      - Swiss tourism: indirect stakeholder, affected by changes in strategies by their members
      - Public transport, travel agencies: indirect stakeholders, they are affected by the actions but neither involved in the project nor included in the decision process
   b) There is a decrease in revenues caused by a decrease in bed-nights. And this problem has be reversed under consideration of a still adequate room price and the financial constraints. But the causes are not yet known exactly. Is it an economic problem because of the strong Swiss Franc? Is it a problem of quality? Are the wrong potential customer addressed by the marketing? Is there are wrong strategy? E.g. to much reliance on customers from certain areas abroad? And if the problem is not solved then maybe there is a further decrease in revenues and the CEO maybe will not be able to hold his position.

c) The obvious one is that the bed nights are decreasing. But the revenues are decreasing more. This means there must be a price – cost problem. Either due to the market pressure the hotel has decreased its room prices to attract more customers or it has an increase in cost e.g. advertisements, staff and so on or both. Thus, both sides, the prices and the cost have to be analysed compared to all the customer data and information. If we further compare the percentage share of the marketing budgets to the percentage of nationalities, we see that the hotel is spending 20% of the budget for Middle East and North America each but only 10% of the customers are coming from there. Further information shows that from North America there is a decrease of guests but from Middle East it is increasing which is in line with the higher marketing spending. On the other side 10% of the marketing budget is for Switzerland but there are 20% customers from Switzerland. From other European countries there are only 10% of guests and marketing budget share of 16% and the information that the number of guests are decreasing.

d) First, progress of the actions have to be visible before the annual assembly of the hotel chain and this in 6 month. Thus, because the actions take some time to be implemented e.g. IT solutions, marketing, reorganisation, and then, there is some time needed until first results are seen, e.g. marketing actions result in outcomes only after several months, the problem has actually be solved by now.

e) The bed nights are decreasing which means that less customers stay in the hotel or less nights. Thus, the analytics should show how to solve the WHY.

3. Stakeholder Analysis Worksheet:

a) & b) Stakeholder needs / stakeholder influence:

i. CEO: having an immediate solution and keeping his job position; will support the project; will provide the budget;

ii. CFO: reducing costs, reducing infrastructure and staff, is concerned about the quality; has to give the budget decided by the CEO; could have a negative impact if the analysis would show other results than expected;

iii. Marketing responsible: wants to have more budget for having the freedom to implement the strategy she think is the right one; will be first be a supporter; could have a negative impact in a later stage if the results should not confirm her expectations;

iv. Parent company: Want to have sufficient gain and thus, a restructuring

v. IT People: just deliver the information, are often in other projects and have no time, thus, not a lot of involvement in such projects; will be more or less neutral in the whole project except they have already some issues with the management and will try to play a game against them;

vi. Staff: a save job, typically no restructuring; could have negative impacts when they fear it could lead to disadvantages for them;

vii. Customer: good quality; will maybe not have any clue that such a project is performed;

viii. Swiss tourism: influence and representation; neutral; no involvement; will maybe informed about certain selective results;

ix. Public transport, travel agencies: business out of the hotel guests; neutral; no involvement in the project; will maybe informed about certain selective results;

Maybe not. Especially, the expectations of the CFO who is only focused on costs and of the marketing responsible who is convinced of getting more budget have a prejudiced mind. The other stakeholders are unclear but often staff sees such analysis often only as a job cutting exercise. Further information has to be collected.

Besides the prejudiced mind of the CFO and the marketing responsible, also the economic situations in Switzerland with the Swiss Franc as well as in the origin countries of the guests have to be considered.

c) Managing stakeholders' expectations

1. see a)

2. Difficult based on the information provided. CEO seems to be realistic about possibilities, whereas the CFO would like to have a cost cutting analysis and thus, does maybe not know all possibilities and limitations and such an analysis is not his expectation; the marketing responsible seems to be too optimistic that her expectations are confirmed. Thus, there could be an expectation mismatch. The expectations of the other stakeholder are not clear currently.

3. No: especially, the marketing responsible's and CFO's expectations are not yet realistic. It could be that neither cost cutting nor more marketing spendings are the best solution. But they have a prejudiced mind.

4. Benefits of the project
   a) *Qualitative benefits:*
      - Giving transparency of the marketing spendings versus the revenues from the guests by region
      - Supporting them in working out actions for the improvement in revenues
      - Supporting them in delivering beneficial information / actions which can be used in the communication with the parent company
      - Helping the CEO to keep his position

   Quantitative benefit:
   In the text several figures have been given. But there are also many missed. One quantitative key argument is always the additional revenues. Some small calculations:

   Bed nights 2015: 182'000
   Revenues from the bed nights 2015: 58'240'000
   Bed nights 2014 (decrease of 10% to 2015): 182'000 / (1-0.10) = 202'222
   Revenues in 2014 (decrease of 15% to 2015): = 58'240'000 / (1-0.15) = 68'517'647

	Marketing budget spend in %	Nationality guests in %
Switzerland	10%	20%
Europe	16%	10%
Russia	14%	20%
Far East	20%	30%
Middle East	20%	10%
Nord America	20%	10%

Based on these figures the return on investment and some scenarios can be calculated, e.g.
1. If the bed nights could be increased by 5%
2. If the guests from Middle East could be increased by 50% with an increase in marketing spending up to 25% (relative to the current CHF 5M) for Middle East.
3. If the Swiss guests could be increased to 30% with a marketing budget increase to 20% (relative to the current CHF 5M) for the Swiss part.
4. If the guests would increase by 5% if the average rate per night would be decreased to CHF 300

This helps us to have a feeling about the revenue sensitivity:

Solution 1. 182'000 x 1.05 = 191'100 bed night; total revenues: 61'152'000; costs: 400'000 for the analytics project (internal and external cost, i.e. internal salaries are covered except IT, because maybe this is outsourced); additional some costs for IT people. Thus, if the costs overall are less than 2.9M then there is a positive outcome. If we make the assumption that the IT salary allocated for this project is totally CHF 20'000 then we have for the return on investment:

(benefit of the investment – cost of the investment) / (cost of the investment)

$$= (2'912'000 - 420'000) / 420'000 = 593\%$$

Solution 2. 10% are from Middle East i.e. 18'200 bed nights. Increase by 50%: 191'100; total revenues: CHF 61'152'000; costs: 400'000 (analytics project), salaries IT and marketing budget increase of 250'000. If the costs overall are still less than 2.9M then there is a positive outcome.

Solution 3. The bed nights are increasing by 18'200 to 200'200, thus, the revenues to 64'064'000 and the costs increase by CHF 500'000. Thus, the increase in revenues is higher than the increase in (marketing) costs.

Solution 4. Bed nights increase by 5%: 191'100; times average rate CHF 300: 57'330'000 of revenues. This would result in even lower revenues than the hotel has today. Thus, in such a case, the project should maybe not be conducted, except it can stop a further decease in bed nights.

b) Investment costs considerations: see a)
c) Other considerations:
   - Are there additional cost if the bed nights are increased? Staff costs, IT costs, costs for travel agencies and so on.
   - Other spendings of the guests in the hotel are not considered e.g. meals, souvenirs,…
   - How can the assumptions for the scenarios be verified
   - Are there new options which are not considered? E.g. marketing in Africa, South America, special offers not yet considered, and so on
d) Recommendation: yes, it seems that if actionable results can be produced for increasing the bed nights without compromising on the average rate, it is worth to undertake the analytics project