Bringing the Customer Back to the Foreground: The End of Conduct Risk?

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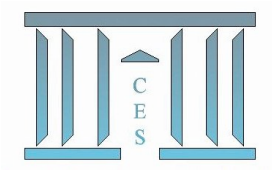

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Abstract

In this chapter we argue that conduct risk arising from the way financial institutions are conducting business with respect to their customers might be prevented, mitigated and potentially annihilated. Indeed, we believe that data science, proper segmentation, product design and control will lead to a tremendous reduction of conduct risk exposure and as such these topics are addressed here.

Keywords: Conduct Risk - Scenario analysis - Risk Management - Data Science

JEL: C02 - G02 - G32

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1 Introduction

Financial institutions mis-conduct or perception of mis-conduct leads to conduct risk. Indeed, the terminology "conduct risk" gathers various processes and behaviours which fall into operational risk Basel category 4 (Clients, Products and Business Practices) (BCBS (2004)) in terms of event, but goes beyond as it generally implies a non-negligible reputational risk. Indeed, financial institutions might be perceived as being unprofessional or not knowing what they are doing. Through the operational risk angle, conduct risk can lead to huge losses, usually resulting from compensations, fines or remediation costs. But from a reputational point of view, it may result in reduced revenues as customers may think that banks does not treat them fairly or worse, are unprofessional as they have been caught cheating. Contrary to other operational risks, conduct risk is connected to the activity of the financial institution (up to a certain extent), i.e. how they generate their income, how they conduct their business with respect to staff, customers, institutions, regulations etc. (e.g. money laundering and non-compliance are issues falling into the lack of integrity matter and consequently are part of conduct risk.)

According to the Financial Stability Board (FSB), "One of the key lessons from the crisis was that reputational risk was severely underestimated; hence, there is more focus on business conduct and the suitability of products, e.g., the type of products sold and to whom they are sold. As the crisis showed, consumer products such as residential mortgage loans could become a source of financial instability" (FSB (2013)). Here the FSB confirmed our statements in the first paragraph, as they identified conduct risk as the main source of reputational risk. In that case we are talking about products sold to consumers. Rightfully, consumers are expecting the products they buy to perform as they have been led to believe, and that these are suitable for them. Again we see here the connection, the relationship operational risk and reputational risk.

Regulatory bodies aim at protecting investors and customers, ensuring fair, orderly and efficiently functioning markets; and facilitating capital formation and transmission. The objective is to promote a trustable market environment, i.e. an environment founded on transparency and integrity. Indeed, institutions such as the SEC, the UK's Financial Conduct Authority (FCA) or the Australian Securities and Investments Commission (ASIC) are focusing on ensuring public trust and consumer and investor protection. Activities that may arm these objectives, such as selling products that are not suitable for their customers, or operating outside a culture that respects consumers interests. In otherwords, these institutions are targeting financial institutions mis-conducts. Most financial institution are customer oriented businesses, in particular retail banks. When a financial institution is accused of money laundering, customers are always on one side of the issue, and when a financial institution produces a flawed product, the customer is the person impacted. By bringing the customer back in the foreground and thinking about doing things right before acting on sole potential profit generation basis, financial institutions will generate more efficient and more sustainable revenues. By dealing with conduct risk, financial institutions are changing the way od conducting business.

To achieve their regulatory prerogatives, authorities are interested in: how firms comply with the regulation, customers experience, product approval processes, decision making process, the firm's behaviour and the remuneration structures. These are indeed inherent factors leading to mis-conduct.

As our goal is to bring customers back in the foreground, in this chapter, we will address the question of how we can increase the knowledge of our customer better, using particular segmentation strategies relying on big data. Then, we will focus on the product design and more specifically on how to address potential flaws and

mis-conception with respect to the target market. Indeed, many techniques coming from other industries can be applied to measure conduct risk and address it while designing new products. We believe that a scenario analysis type of process should be implemented every time a new product is designed. Here the term design comprise the set of strategic and tactical tasks and activities, starting from the initial idea, the concept, the first model to the commercialisation of the products, in other words the design phase for us finishes when the first product is sold to a first customer. The products will be designed with respect to the market segment targeted.

Indeed, we will argue that most conduct risk issue can be addressed through the process of designing a products, as a product is usually design for a particular market segment, it has to comply with a set of rules and regulations, sales people remuneration is usually linked to product sales, and the intrinsic characteristic of the product have to be properly set so the product behave as expected. Issues have to be proactively tackled by understanding customers, improving our knowledge of them and analysisng how the product may fail them and consequently the bank. Scenario analysis and bid data are likely to be the tools to deal with conduct risk and hopefully annihilate it. The sole focus on profit generation seems to lead to an over conduct risk exposure and to an less efficient generation of income.

Therefore, in this chapter we will address issues leading to conduct risk i.e. the lack of integrity of the financial institutions due to dealing with unknown customers, flaws in the product, or the sales process, e.g. how customers (or any third party) are treated and how product are designed. These matters are clearly linked to the risk "culture" of the financial institutions.

Remark 1.1. *Note that the issue might be related to the customer perception and not an actual issue with the product created by the financial institution, and this might be quite complicated to address as sometimes doing the right thing might not be perceived*

as such.

2 Know your customer - Data Mining for Segmentation

In a first stage, it is important for financial institutions to understand (now more than ever) who they are dealing with, i.e. what business they are accepting and to whom they are selling their products. Thought the statement "know your customer" is simple, what it implies is rather complicated as it requires a dynamic capture of customer evolution and behaviours. Indeed, the same person taken at two different point in time of her life should be considered and treated as two different customers (up to a certain extent).

2.1 Dynamic segmentation

To ensure that products are sold to the right people, it is necessary to change the way the market is segmented.

Segmentation is a marketing strategy involving splitting the target market into subsets that have common characteristics and designing product adapted to the segment. Segmentation allows identifying and further defining the target customers, providing data to elaborate the marketing plan. The product created are then adapted to the different market segment, in other words, it would not be possible to offer a mortgage to a first year student. Financial institutions traditionally develop different strategies involving specific products or product lines depending on the attributes of the targeted segment.

Though practitioners usually (or initially) segment with respect to geographic criteria—nations, states, regions, countries, cities, neighborhoods, or postal codes, in a first stage and with respect to demography i.e. considering age, sex, generation,

religion, occupation and education level (Riley (2012)) or according to perceived benefits which a product or service may provide in a second stage, we would argue that behavioral segmentation divides consumers into groups according to their knowledge, attitude, usage of something would be the most appropriate way to define market segments (Kotler and Armstrong (2010)) in particular considering our objective to nip conduct risk in the bud.

Indeed, this allows a dynamic adaptation of the segment and regular switch from one segment to another according to the segment characteristic considered. However, on the more complex side, it is rather complicated to obtain all the data necessary to achieve such a dynamic approach, to make sure that we know our customer all the time and not point in time. Once again, a customer one day cannot be considered identical the next and the product sold might not be appropriate anymore. This is where data sciences introduced in the next section might be useful.

2.2 Data science support

The purpose of data science and here in particular data mining (Hastie et al. (2009)) is to extract information from data sets. The analysis of large quantities of data allows detecting interesting patterns such as clusters (Everitt et al. (2011)), anomalies, and dependencies, and the outcome can then be used for further analysis in machine learning, predictive analytics or more traditional modelling and in our case to achieve the dynamic segmentation in question.

Data mining is widely used by companies with a strong consumer focus, in other words, retail, financial, communication, and marketing organisations (Palace (n.d.)). These types of companies were mining data to analyse relationships between endogenous and exogenous factors such as respectively price, product positioning, and economic indicators, competition, or customer demographics. as long as their in-

fluence or impacts on sales, reputation, corporate profits etc. Besides, it permitted summarising the information analysed. Generally, any of four types of relationships are sought: classes, clusters (Everitt et al. (2011)), associations (Piatetsky-Shapiro (1991)) and sequential patterns.

To summarise the data mining process, this one consists in the following major elements: capture, pre-processing - data selection, cleansing and anomalies detection and transformation -, processing - outlier detection, relationship analysis, pattern recognition and summarisation - and integration in the decisions making process.

3 Product creation

Once customers are understood, the segmentation properly achieved it can be used as a base to proper product design. As suggested in the introduction, product issued by financial institutions should be subject to a drastic quality control, not only once the product is finished, but all along the product creation, design, management, etc. The quality control defined by the norm ISO 9000 - "A part of quality management focused on fulfilling quality requirements" (Poksinska et al. (2002)) - should be transformed into a quality defect prevention process, and here by defects we will obviously focus on conduct risk.

Consequently here we are interested in analysing and testing the products to uncover defects or potential risk of failures leading to conduct risk and reporting to the senior management who can decide to prevent the product from being released or sponsor corrective actions, i.e. this is an *ex ante* process by opposition to an *ex post* quality control. We believe that prevention may help financial institutions reducing their exposure to conduct risk related losses and help them mitigating their potential remediation costs.

Many approaches have been proposed over time by both practitioners and academics to address the issue, such as Ishikawa Fishbone diagram, or root cause analysis among others (Hassani (2016-2017)).

3.1 Ishikawa diagrams

Ishikawa diagrams are causal diagrams created for quality management processes purposes (Ishikawa (1968)). Indeed they are used for product design and quality defect prevention. Ishikawa diagram are also refred to as fishbone diagram because of its figure similar to the side view of a fish skeleton.Each cause of potential imperfection should be considered as a source of product design variation. As illustrated in Figure 1 potential fault sources are identified and gathered into various categories as follows:

1. People: Anyone involved with the process
2. Process: Goverance, policies, committees, procedures, etc.
3. Equipment: Any equipment, computers, tools, etc. required to achieve a task
4. Materials: Raw materials (in a large sense)
5. Management and Measurements: Data generated from the process used to evelaute the quality
6. Environment: Culture, law, regulation etc.

Each and every source of variation should be considered to avoid defect and faults at any stage of the product, for example this allows analysing how adapted the product is to a specific market segment and make sure that it has been designed consistently.

3.2 Fault Tree

The FTA is a top down, deductive failure analysis in which an undesired state of a system is analysed using boolean logic to combine a series of lower-level events

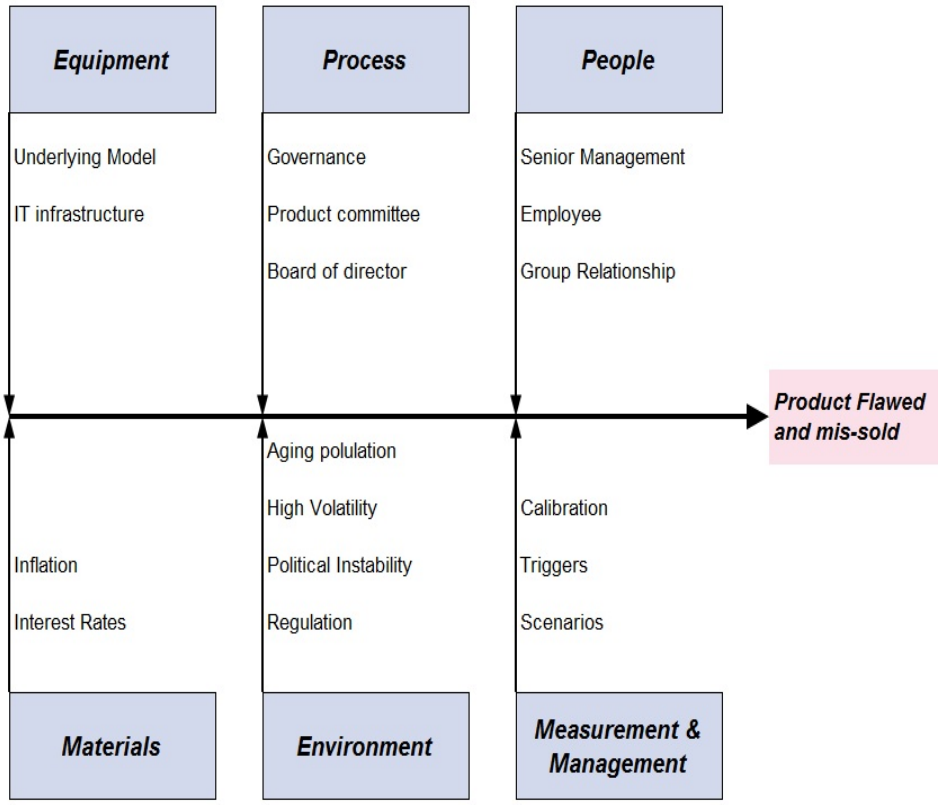

Figure 1: Hishikawa diagram illustration

(Martensen and Butler (1975), DeLong (1970), Larsen (1974), FAA (1998)).

To be more specific regarding how the FTA can be used to, the following enumeration should be enlightening

1. understand the logic, the chain of events and the conditions leading to an undesired event.
2. show compliance with the regulation and the commercial principles.
3. prioritise the contributors leading to the top event -
4. optimise resources.
5. assist in designing a system. Indeed, the FTA may be used as a design tool, helping avoiding common failures and measuring effect of design modifications. In this section, we will focus on this aspect of the methodology.
6. function as a diagnostic tool to identify and correct causes of the undesired event. This will alos be useful to design the product as it may help identifying sources of variations
7. quantify the exposure by calculating the probability of the undesired event.

To illustrate the process, the undesired outcome is taken as the top of a tree such as: the insurance product has been mis-sold. Working backward it is possible to determine what led to the failure, i.e. a fault in the product intrinsic characteristics or the wrong target segment targeted. This condition is a logical OR. Considering the branch analysing when the wrong market segment is targeted, we are in the presence of another logical OR, i.e. the population targeted is not in capacity to understand the product characteristics or the customers targeted are only those who have been customers for at least ten years and trust the bank no matter what and are easier targets for the sales people in the branch. On the other side of the tree, regarding the

fault in the product characteristics, a logical AND relationship appears, as we may assume that the term sheet of the product is misleading and the product does not behave as expected due to a high volatility in the markets. Fault trees events can be associated with failure probabilities, and it is possible to calculate the likelihood of the undesired event to occur.The diagram is usually drawn using conventional logic gate symbols. The route between an event and an initiator in the tree is called a cut set. The shortest credible way through the tree from fault to initiating event is usually referred as a minimal cut set.

Figure 2 illustrates the Fault tree described above. If the fault tree is used to analyse the potential causes of failures, it necessary means that these have been identified and therefore these can be dealt with, i.e. the awareness of the potential causes of failure lead to the implementation of new controls and a better attentions to some particular aspect of the product design.

Indeed, conduct risk related to product flaws have to be prevented as the remediation costs experienced are far too large to be acceptable, besides the loss of profit is not acceptable for any company.
The construction of a fault tree is an iterative process, which has 6 clearly defined steps, for instance (*Fault Tree Analysis* (1999)):

1. Review the gate events
2. Identify all the possible causes of this event and ensure that none are missed
3. Identify the cause-impact relationships at each node
4. Structure the tree consistently
5. Ensure events are unique at each gate.
6. Repeat the process at the next gate.

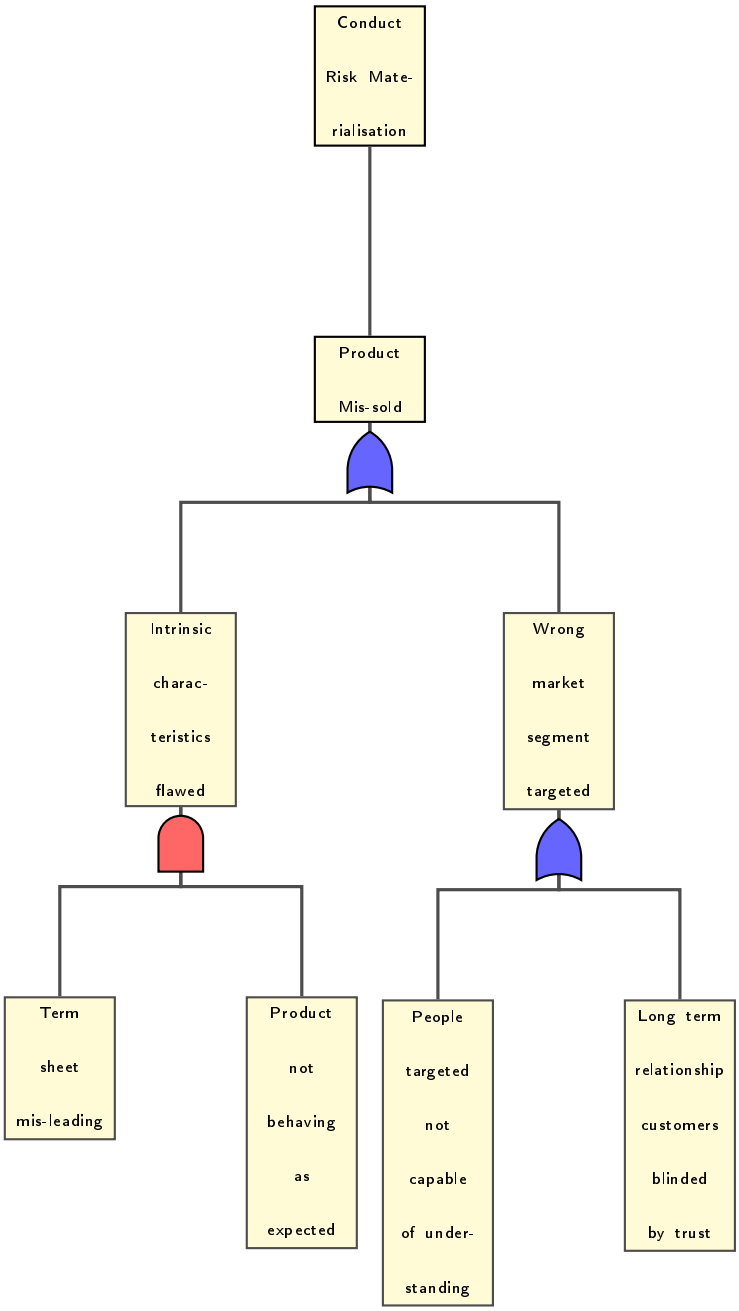

Figure 2: Simple Fault Tree: This fault tree gives a simplified representation of the process leading to the materialisation of a conduct risk due to a product mis-sold.

While informing each gate node involves a 3 steps:

- Step 1 - Immediate, Necessary and Sufficient (INS)
- Step 2 - Primary, Secondary and Command (PSC)
- Step 3 - State of the System or Component

Analysing this first step in detail, the question to be answered is are the factors immediate, necessary and sufficient (INS)to cause the intermediate event? The we need to consider the fault path for each enabling event and identify each causing event identifying if they are primary fault, secondary faults or command faults. Then, it is possible to structure the sub events and gate logic from the path type. The last step requires addressing the question is the intermediate event a state of the system or a state of the component. "State of the component" implies that we are at the lowest level for that issue, while "state of the system" implies subsequent issues.

3.3 Failure mode and effects analysis (FMEA)

The FMEA might be used to systematically analyse product component potential failures (Koch (1990)). All significant potential failure should be considered to design the product. The primary benefit of the methodology is the early identification of issues to be addressed during the design of the product (recall that we considered the governance is considered part of the design phase).

The main benefits of the FMEA process are the following:

- It helps maximising the chance of designing an appropriate product.
- It supports the assessment of potential failure as well as their their impacts, allowing to rank them and prioritise them.
- It permits the early identification of single points of failure.

- It allows troubleshooting and product variation at any point in the design process.
- Easy to implement.

In that case, I would not consider a particular template as in that case it is necessary to adapt it to the design of financial products.

3.4 Root Cause Analysis

Root cause analysis (RCA) aims at solving problem by dealing with their origination (Wilson and Anderson (1993), Vanden Heuvel et al. (2008), Horev (2010) and Barsalou (2015)). RCA allows identifying and correcting the root causes of events before they materialise, rather than dealing with the symptoms. This methodology aims for prevention while it acknowledges the fact that it is not always possible to create a failure proof product.

Though the analysis is usually done after an event has occurred, *post-portem*, this one could be considered to feed future product design or to analyse a scenario of failure or fault to manage them effectively and efficiently.

RCA allows identifying the factors leading to a failure, preventing recurrence of issues, focusing on the lesson learnt and documenting the sequence of events leading to the failures supports controls positioning. The methodology helps transforming a reactive culture into a forward-looking culture. Note that absolute transparency is required and that RCA might be highly data consuming (Shaqdan et al. (2014)).

3.5 Why-Because Strategy

The Why-Because analysis has originally been developed to analyse accidents (Ladkin and Loer (1998)). A why-because graph presents causal relationships between factors of a failure easily applicable to financial products, as a directed acyclic graph in which the factors are represented by nodes and relationships between factors by directed edges.

"What?" is always the first question to ask, though as a forensic analysis it is a simple analysis as consequences are understood, for conduct risk it might slightly be more complicated as sometimes potential issues are not necessarily straight forward. We need to remember that a financial institution may think they have done something appropriate but customer may believe the contrary, or may perceive differently. The methodology relies on an iterative process to determine causes of failure.

Each contributing cause must be a necessary and all causes must be sufficient to cause it (Ladkin (2005)).

3.6 Bayesian Network

A Bayesian network is a probabilistic graphical model representing random variables and their conditional dependencies using a directed acyclic graph (DAG). Formally, the nodes represent random variables in the Bayesian sense, in our case product specificities. Edges exhibit conditional dependencies, if the nodes are not connected, they are assumed independent. Each node has a probability function which from the node's parent information, returns the probability of the variable represented by the node.

Bayesian Belief Networks are very valuable to design financial products as they combine of data and expertise. They can be constructed using few data points, with or

without knowledge of the underlying failure process, besides Bayesian networks are scalable. Corney (2000) shows that they are as accurate as neural networks, but with the advantage of being reversible, and therefore permits assessing the likelihood of a design to fail and on the contrary the likelihood of a design to succeed.

Modelling failure factors help understanding the impact and consequently support the control implementation. Besides the quality of the control implemented can be evaluated and considered in the analysis.

Figure 3 illustrates the construction of a simple Bayesian network. The node from which the arrow (arc) starts is refered to as the parent, and the node where the arc ends as the the child. In our example, Aa is a parent of Dd, and Dd is the child of Aa. Nodes that reachable from other nodes are called descendants. Nodes on the path to a specific node are called ancestors. Here, Ee and Ff are descendents of Bb, and Bb and Dd are ancestors of Ff.

For proper calculation we will refer to (Haff (1979), Pourret et al. (2008)) or (Pearl (2000))

4 Conclusion

Conduct risk management requires changing the way the business is conducted and the income generated. For instance, financial institutions may need to close some revenue channel because it is the right thing to do as the products sold are inappropriate, or they should change the way sales people are remunerated if it appears they were forced to deliver a certain number of sales per day no matter what otherwise they might end up in a position of selling quanto products to grand-mothers, or accepting transactions from unknown people, assuming that these are genuine without any other form of verifications.

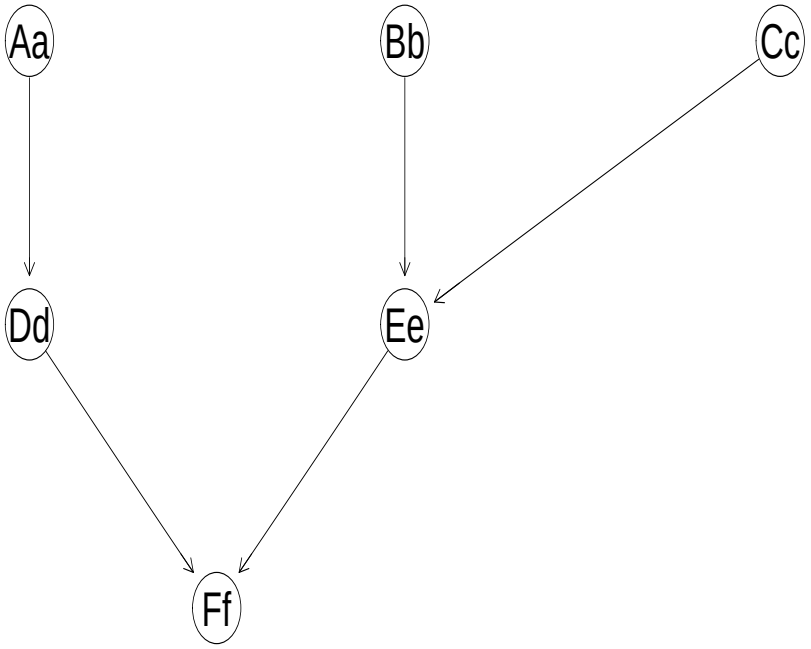

Figure 3: Illustration: A Simple Directed Acyclic Graph - This graph contains 6 nodes from Aa to Ff. Dd depends on Aa and Ee depends on Bb and Cc. Ff depends on Dd and Ee and through these nodes Aa, Bb and Cc.

In this chapter we actually addressed conduct risk awareness and management. To summarise, it is necessary to make sure that we know our customer and that the products sold are appropriately designed to make sure that these will not lead to the materialisation of conduct risk. After introducing the requirements of a dynamic segmentation strategy, we introduced methodologies traditionally used for product design in other industries which should be adapted systematically before any product is released. Other alternatives (Hassani (2016-2017)) are available such as Neural networks or assessment through workshops, though we believe in that case that carefully

analysing and representing each every factory potentially leading to a failure may be more appropriate, requires less quantitative background (except for the Bayesian networks) and are easier to present to the senior management ultimately responsible for the approval of a product.

However, it is important to bear in mind that conduct risk modelling implies another kind of risk: model risk, and this one must be addressed too. Indeed, if the methodology used to analysed and design the product is itself flawed, the product will not be properly designed and the conduct risk unmitigated (Hassani (2015)). However, it is interesting to note that the scenario methodologies presented such as Bayesian networks can be extended to other risk issues.

References

Barsalou, M. (2015), *Root Cause Analysis: A Step-By-Step Guide to Using the Right Tool at the Right Time.*, CRC Press, Taylor and Francis, Boca Raton.

BCBS (2004), 'International convergence of capital measurement and capital standards', *Bank for International Settlements, Basel* .

Corney, D. (2000), Designing food with bayesian belief networks., *in* 'Evolutionary Design and Manufacture', Springer, London, pp. 83–94.

DeLong, T. (1970), 'Ta fault tree manual', *Master's Thesis (Texas A&M University)* .

Everitt, B., Landau, S., Leese, M. and Stahl, D. (2011), *Cluster Analysis*, 5th edition, John Wiley and Sons, New York.

FAA (1998), 'Safety risk management', *ASY-300, Federal Aviation Administration.* .

Fault Tree Analysis (1999).
URL: *www.thecourse-pm.com*

FSB (2013), 'Thematic review on risk governance', *Financial Stability Board* .

Haff, L. (1979), 'An identity for the wishart distribution with applications', *Journal of Multivariate Analysis* **9(4)**, 531 – 544.

Hassani, B. (2015), 'Model risk - from epistemology to management.', *Working Paper, Université Paris 1* .

Hassani, B. (2016-2017), *Scenario Analysis in Risk Management: Theory and Practice in Finance*, To Appear Springer, Berlin.

Hastie, T., Tibshirani, R. and Friedman, J. (2009), *The Elements of Statistical Learning: Data mining,Inference,and Prediction.*, Springer, New York.

Horev, M. (2010), *Root Cause Analysis in Process-Based Industries.*, Trafford Publishing, Bloomington.

Ishikawa, K. (1968), *Guide to Quality Control.*, Asian Productivity Organization, Tokyo.

Koch, J. (1990), 'Jet propulsion laboratory reliability analysis handbook', *Project Reliability Group, Jet Propulsion Laboratory, Pasadena, California* **JPL-D-5703**.

Kotler, P. and Armstrong, G. (2010), *Principles of Marketing*, Pearson Education Limited, Melbourne.

Ladkin, P. (2005), 'The glenbrook why-because graphs, causal graphs, and accimap', *Working Paper, Faculty of Technology, University of Bielefeld, German* .

Ladkin, P. and Loer, K. (1998), 'Analysing aviation accidents using wb-analysis - an application of multimodal reasoning', *AAAI Technical Report* **SS-98-0**, 169–174.

Larsen, W. (1974), 'Fault tree analysis.', *Picatinny Arsenal. Technical Report 4556.* .

Martensen, A. and Butler, R. (1975), 'The fault-tree compiler', *Langely Research Center, NTRS* .

Palace, W. (n.d.), 'Data mining: What is data mining?', *www.anderson.ucla.edu* .

Pearl, J., ed. (2000), *Causality: Models, Reasoning, and Inference*, Cambridge University Press, Cambridge.

Piatetsky-Shapiro, G. (1991), *Discovery, Analysis, and Presentation of Strong Rules*, AAAI Press, Menlo Park CA.

Poksinska, B., Dahlgaard, J. and Antoni, M. (2002), 'The state of iso 9000 certification: A study of swedish organizations', *The TQM Magazine* **14**, 297–306.

Pourret, O., Naim, P. and Marcot, B., eds (2008), *Bayesian Networks: A Practical Guide to Applications*, 1th edition, John Wiley & Sons, London.

Riley, J. (2012), 'Market segmentation'.
URL: *http://www.tutor2u.net/business/reference/market-segmentation*

Shaqdan, K., Aran, S., Daftari Besheli, L. and Abujudeh, H. (2014), 'Root-cause analysis and health failure mode and effect analysis: two leading techniques in health care quality assessment.', *J Am Coll Radiol.* **11(6)**, 572–579.

Vanden Heuvel, L., Lorenzo, D. and Hanson, W. (2008), *Root Cause Analysis Handbook: A Guide to Efficient and Effective Incident Management.*, Rothstein Publishing, New York, 3rd Edition.

Wilson, P.F.and Dell, L. and Anderson, G. (1993), 'Root cause analysis: A tool for total quality management', *ASQ Quality Press.* **SS-98-0**, 8–17.