

## **EDUCATING FUTURE ACTUARIES TASK FORCE—REPORT TO THE WASHINGTON D.C. IAA EDUCATION COMMITTEE MEETING**

### **Background**

At the Singapore meeting, the Education Committee agreed to form a Task Force to look at the core competencies of the actuary in a changing global environment, prompted by some internal and external changes experienced by some member societies of the IAA. The intention was to provide a framework for educating the future actuary in a way that responds to these changes, specifically as input to the next review of the Core IAA Syllabus.

While the specific drivers of change were mentioned in the input paper at Singapore and are encapsulated in the Task Force's Terms of Reference (see below), the Task Force specifically noted an Economist article, which came out in January, referring to the future world of work. This article, at <http://www.economist.com/news/leaders/21594298-effect-todays-technology-tomorrows-jobs-will-be-immense-and-no-country-ready>, particularly noted that changes in technology will change the future world of work, just as it has done in recent history. The article suggests that education is critical in this future change and suggests that future education should "foster the creativity that humans will need to set them apart from computers. There should be less rote-learning and more critical thinking."

### **Composition and meetings**

After the Singapore meetings, members of the Education Committee were invited to join the Task Force or nominate others from their Associations to join. The core group consisted of 15 people, with a fairly good geographical spread of membership, although with little representation from smaller associations. A number of other people served as interested persons. The detailed membership of the Task Force is set out at [http://www.actuaries.org/index.cfm?lang=EN&DSP=CTTEES\\_TFEFA&ACT=MEMBERS](http://www.actuaries.org/index.cfm?lang=EN&DSP=CTTEES_TFEFA&ACT=MEMBERS).

The Task Force had seven meetings by teleconference, which generated very good discussion. Once input has been received at the Washington D.C. meetings, the intention is to resume meetings and provide a final report at the London meetings.

The Task Force would like to thank Christian Levac for his support over this period, despite the IAA Office being short-staffed and a myriad of other responsibilities.

### **Methodology**

The group initially focused on agreeing to Terms of Reference as well as building a base of input material for group members to read. This resource base of input material included the output of the IAA Task Force on the Role Of The Actuary, as well as material from many of the actuarial associations represented.

Members of the group were then invited to submit a list of the core competencies that the future actuary should possess. These were then discussed, and there was a fair degree of consensus around these competencies, including those which may be regarded as practical/non-technical skills. Members were then invited to discuss four important questions that arose, given this set of core competencies. Based on this set of core competencies, as well as the responses to the questions, the Task Force believes they have a fair degree of consensus at a high level, and it is now important to discuss this with the Education Committee before proceeding further.

## **Terms of Reference**

A draft Terms Of Reference was prepared by the Chairperson of the Task Force, using the original paper submitted at Singapore as a framework. This was discussed and edited by the Task Force, with an agreed version sent to the Education Committee. After some wording changes suggested by the Committee, a final version was placed on the IAA website. This version is included as Appendix A of this report.

## **Core Competencies**

Many members of the Task Force submitted their lists of the core competencies that the future actuary should possess. These lists are included as Appendix C. Steve Eadie set out a summary of the inputs, including setting out an indication of the depth of skill level required, using Bloom's Taxonomy as a framework. This is included as Appendix B and should be considered as very useful input in the next syllabus review. The Task Force agreed an indication of depth of coverage and a more precise definition of the skill required is critical, and should be taken into account for the next syllabus review.

Some important trends that were noted from the input submitted, and may be critical in looking at future actuarial education, include

- Fairly universal agreement that understanding/modelling/managing risk is at the core of the profession.
- Technical competencies are generally close to what is being taught now, with the possible exception of data analytics, which a number of people have suggested is an area which should become an actuarial competency. In addition, there are some suggestions that a greater understanding of Enterprise Risk Management concepts and non-financial risk should be required to ensure that understanding/modelling/managing risk is a key competency.
- An understanding of, and adherence to, standards of professional conduct and practice is considered an important competency
- General view is that a wider range of "practical" skills (often known as "normative" skills) should be part of the actuarial competency. Aside from the professionalism/communication angle, strategic thinking, business skills, decision-making, seeing the big picture, leadership, teamwork are all suggested as important.
- An understanding of the practical context in which actuaries operate i.e. economics, operation of financial services is widely seen as important. There is some suggestion that this context should be expanded to areas such as banking.

## **Key Questions**

Arising from this discussion of core competencies, some important questions were raised, and discussed in-depth by the group. Individual responses from the Task Force are included as Appendix D. The specific questions, and a very high-level summary of the responses are set out below.

*Are there any competencies unique to actuaries? Or is the combination of the technical /practical that makes actuaries unique?*

The general view is that there is no single competency/technical skill unique to actuaries. However the combination of a person with a deep technical understanding and ability to model risk, with the professionalism component, particularly adhering to standards of professional conduct and practice, is distinctive and extremely powerful, and therefore the actuary as a professional risk manager *should* be able to make a unique and significant contribution to society.

*How much of the normative/practical element do we add as a core competency, and therefore something an education system should ensure proficiency in the skills.*

There is consensus that a considerable amount of the normative/practical skill element is important. The professional and communication elements are already covered to some extent in the IAA Core Syllabus. Business/strategic/leadership/decision-making skills were also mentioned by many people, and are areas that actuaries are possibly perceived as weaker in. Therefore these skills are important and should be integral to the education systems. However several recent studies on professional education indicate the importance of integrating technical and practical education, which presumably would help develop these skills to at least some extent. Therefore “new” subjects and separate assessments in the IAA syllabus may not be necessary.

*Do we have a core element, and then a number of specializations? Are the specializations additional to becoming an actuary (at least at IAA level) or should a person have a specialization to be an actuary (maybe interesting to consider the medical profession)?*

There are differing views here, linked also to the current differences in the way different countries have set up their actuarial education system. However, there seems to be some support for ensuring a common core which can be applied in a number of different specialist areas (including some newer areas, particularly banking) with the IAA providing some guidance on the coverage required in these specialist areas.

*If we’re adding to the core syllabus, we almost certainly need to take out. What can we take out?*

To some extent, this is a question that should be revisited during an in-depth syllabus review. However, a useful suggestion is to ensure appropriate depth of coverage for each topic i.e. some topics may not be covered in as much depth as current, especially at a non-specialist level.

### **Discussion At The Washington D.C. Meeting**

As the previous sections indicate, the Task Force believe that the changing external environment does require an adaptation by the actuarial profession, and will consequently change the way we think about actuarial education. While the fundamental nature of the profession as one with a deep understanding of risk should serve us well in the future, the education system should adapt to one requiring higher order skills of critical thinking, analysis and judgment. The future actuary will be required to understand the context of their work in even more detail, communicate effectively and play an important role in leading businesses, as well as work more in teams involving non-actuarial professionals. The emergence of data analytics as a new field that actuaries should be not only aware of, but leading in, is also important.

In this respect, the Task Force sees that some important change is required, not only in what is covered in the education syllabus, but the way that education is delivered, if we are to be relevant for the actuary of the future.

While the Task Force has achieved a fair amount of consensus in our thinking so far, it is important to test this with the wider Education Committee. Therefore, we suggest the discussion in the Committee focus on

- 1) Does the Education Committee agree with the broad principles set out in this document?
- 2) Is this thinking practical –especially for smaller associations who were not well represented on the Task Force?

We look forward to a productive discussion on issues which we see as core to the worldwide growth of the actuarial profession, as well as ensuring the relevance and importance of the profession to society in years to come.

Respectfully submitted

Educating Future Actuaries Task Force

10 March 2014

## **APPENDIX A: TERMS OF REFERENCE**

Under the general direction of the Education Committee, the Educating Future Actuaries Task Force will review the fundamental nature of actuarial education and will identify and define the core competencies that should be attained and exemplified by actuaries of the future, and the resulting learning objectives for the International Actuarial Association's core education syllabus. These will then be compared to the current IAA core education syllabus and will be considered during the next IAA core education syllabus review.

The goal is to ensure that at the point of qualification, members of the actuarial profession are equipped to make an important and valuable contribution to society and to the organizations they serve.

The key drivers for establishing this Task Force are

- Significant changes in the demand for actuaries, with some diminished demand in traditional fields for actuaries such as life insurance and pensions, and increased demand in non-traditional practice areas in some regions, such as in broader financial services.
- Some countries are reviewing their actuarial syllabuses and considering which fundamental concepts should be covered in the core actuarial training. The Task Force will assist these reviews by facilitating international collaboration.
- Feedback from IAA Full Member Associations requesting refinements to the IAA core education syllabus.
- With a common understanding of the core competencies of the actuary, the international profession will be in a better position to promote and support appropriate education for the actuary of the future, and ensure relevance in a constantly changing environment.

Membership of the Task Force will include one representative from each full member association represented on the Education Committee, should that association choose to nominate a representative. Additional people can be involved in the Task Force as interested parties. All members of the Task Force are expected to be actively engaged and complete work assigned to them within the timeframes requested.

The Task Force will present provisional findings to the IAA meetings in Washington DC in March 2014, with a final report for the London meetings in September 2014.

## **APPENDIX B: SUMMARY OF CORE COMPETENCIES USING BLOOM'S TAXONOMY (STEPHEN EADIE)**

I think we need to consider the competencies based on level of learning. Bloom's taxonomy lists six levels of learning; Knowledge, Comprehension, Application, Analysis, Synthesis and Evaluation.

### **What should every actuary know? (Knowledge and Comprehension)**

Every actuary should have an understanding of the mathematics that is core to our profession. I would include in this; general probability, probability distributions, financial mathematics, numerical methods, statistics (including applied statistics), credibility theory, parametric and semi-parametric models (including extreme value models) and stochastic modelling.

Every actuary should also have an understanding of the common theory that is used to manage large enterprises. I would include in this; economics (including financial economics), demography, investment theory, corporate finance, basic accounting, basic law, governance structures, regulatory systems and risk management frameworks.

Every actuary should have an understanding of the common methods used in actuarial work. I would include in this; actuarial control cycle, insurance systems (including re-insurance), data maintenance and analysis, setting assumptions, experience studies, pricing methods, reserving methods, funding methods, capital allocation methods and risk management frameworks.

Every actuary should have an understanding of external forces that are relevant to common actuarial work. I would include in this; legislation, regulations, investment practices, demographic trends and financial security system structures.

Finally every actuary should have an understanding of his role as a professional actuary. I would include in this; professional standards, standards of practice and professional ethics.

### **What should every actuary be able to do? (Application and Analysis)**

Every actuary should be able to apply the mathematics that is core to our profession. Every actuary should be able to calculate risk-based amounts and determine risk metrics. Every actuary should be able to use the mathematical outputs to manage real risk-based problems.

Every actuary should be able to apply the actuarial control cycle appropriately.

Every actuary should be able to analyze a given data set using modern statistical methods including estimation, data analysis, regression analysis, time-series, etc.

Every actuary should be able to interpret the results of an experience study and use those results to set appropriate actuarial assumptions. Every actuary should be able to analyze the results of an experience study including applying statistical methods to validate.

Every actuary should be able to establish appropriate model parameters and confirm that the model output is reliable. Every actuary should be able to select an appropriate set of assumptions for a given problem. Every actuary should be able to determine whether individual assumptions are necessary and a set of assumptions are sufficient for that problem.

Every actuary should be able to apply common actuarial models to determine appropriate prices, reserves or funding values. Every actuary should be able to determine appropriate capital allocations for an enterprise.

Every actuary should be able to analyze actual experience for an existing actuarial solution and to monitor the results of an actuarial process appropriately.

Every actuary should be able to communicate work results to peers, managers, clients and the public. An actuary should be able to select and use all common communication delivery systems.

Every actuary should be able to check the work prepared by non-actuaries that is related to actuarial work.

Every actuary should be able to apply all relevant standards of practice in preparing work.

Every actuary should be able to manage their own work requirements effectively.

### **What should every actuary be able to do in the actuary's specialty? (Synthesis and Evaluation)**

Every actuary should be able to completely define any problem that is relevant to the actuary's specialty. This would include consideration of all relevant external forces including local regulatory requirements and standards of practice.

An actuary should be able to create solutions that are relevant to material stakeholders in the actuary's specialty while considering broader societal and organizational goals. An actuary should recognize emerging trends within the actuary's specialty.

Every actuary should be able to appropriately integrate common techniques used in the actuary's specialty into solutions for non-specialty problems.

Every actuary should be able to peer review another actuary's work in the actuary's specialty.

Every actuary should be able to design an appropriate solution for any material problem in the actuary's specialty. An actuary should be able to recommend a best solution from a variety of solutions in the actuary's specialty and to communicate the actuary's reasoning for the recommendation to all material audiences. An actuary should anticipate trends that could affect a solution.

Every actuary should be able to design a complete monitoring system for any actuarial solution within the actuary's specialty. The actuary should be able to modify the monitoring system, as appropriate, given emerging experience. The actuary should be able to assess the validity of an existing monitoring system and select the best monitoring system from available options.

Every actuary should be able to communicate material aspects of any problem and proposed solutions sufficiently well to allow informed decision making by the users of the actuary's work. An actuary should be able to participate and, at times, facilitate the decision-making process with respect to material problems in the actuary's specialty.

Every actuary should be able to lead a team that is assigned actuarial work in the actuary's specialty. The actuary should be able to supervise the work of non-actuaries.

An actuary should be able to work as part of a team on large problems and function effectively with all other members of the team.

Every actuary should be able to communicate work results to peers, managers, clients and the public. An actuary should be able to participate effectively in debates relevant to the actuary's specialty.

Every actuary should be able to apply all relevant standards of practice in preparing work in the actuary's specialty. An actuary should be able to interpret and adjust existing standards of practice to fit new or emerging problems.

## **APPENDIX C: CORE COMPETENCIES SUBMITTED BY TASK FORCE MEMBERS**

### **WARREN LUCKNER**

BACKGROUND. As background for a list of competencies actuaries of the future should possess, I provide the following:

1. Definitions of the word “competency”, both in general and specific to a current actuary (as defined by the Society of Actuaries in the U.S.)
2. My personal view of what an actuary currently does in general and will continue to do in the future
3. My personal view of the special public interest of the actuarial profession, currently and for the future
4. The purpose for actuaries having the competencies listed

Definition of “competency”:

*Wikipedia.* The ability of an individual to do a job properly. A competency is a set of defined behaviors that provide a structured guide enabling the identification, evaluation and development of the behaviors in individual employees.

*Society of Actuaries (U.S.).* A competency is defined as a skill, knowledge, ability or behavioral characteristic associated with a specific profession.

My personal view of what an actuary currently does in general and will continue to do in the future: The work of the actuary is to identify, quantify, and manage risk and uncertainty to the benefit of society.

My personal view of the special public interest of the actuarial profession, currently and for the future: The actuarial profession has a special public interest of ensuring the sustainability of systems that involve risk and uncertainty

The purpose for actuaries having the competencies listed: The goal is to ensure that members of the actuarial profession will continue to make an important and valuable contribution to society and to the organizations they serve.

COMPETENCIES. My list is based in part on a review of the Australian list of capabilities and the Society of Actuaries (U.S.) list of competencies.

*Competency related to the context within which actuaries work*

1. Understand the economic, financial, regulatory and social environment, both current and potential

*Unique/distinctive competencies of actuaries*

2. Identify and understand risks and their implications
3. Ability to quantify risk using state of the art approaches
4. Identify, understand and implement approaches to managing or mitigating risk

*Competencies related to being a member of a profession*

5. Maintain skills in a changing environment
6. Adhere to standards of professional conduct and practice that serve the special public interest of the actuarial profession

*Important competencies to enhance value of unique/distinctive competencies*

7. Communicate effectively regarding actuarial responsibilities through listening, writing and speaking skills
8. Contribute to effective decision-making regarding actuarial responsibilities

9. Demonstrate leadership in initiating or completing actuarial responsibilities
10. Contribute to effective strategic planning for the organizations they serve

### **JOHN SHEPHERD**

Given a business or related problem (involving risk or uncertainty):

Analyse the problem

- Recognise relevant (social, historical, political, etc) aspects of problem

Identify appropriate data

Collect and validate data

Consult & work with other experts as required

Choose appropriate methods/models

Analyse/model the data

Interpret the results of analysis or modelling

Document the work continuously (audit trail)

Communicate implications of results to a range of stakeholders

- Boss (more senior actuary)

- Client

- Other experts

### **RAFAEL MARANO**

I feel very comfortable with the thoughts and comments in the discussion directory on the dropbos. Nevertheless, and being coherent with our last discussion, I think we should concentrate no won competencies, and not starting with contents.

I find especially interesting the ones from Marjon Tija and Warren Luckner.

I would only add this competency that I think it's relevant:

*Long term thinking, with a strong orientation to fulfillment of obligations arising from policies or (pension) plans.*

## MARJON TJIA

### Changing (work)environment for the Actuary of the future

- Capital and risk management becomes an integral part of an active dynamic business planning and management cycle
- New game: this involves more than just a new set of actuarial and risk technical calculations. This will impact the way actuarial professionals think, act and do business
- The role of the actuary is expanding beyond traditional areas: a great opportunity for the actuaries to be more involved with the business and demonstrate value and 'make a difference'

The following professional profile of the actuary is based on the report of 'the actuary of the future'

The actuary is someone who:

is an authoritative specialist in risk management

- risk modelling and analysis

- pricing

- risk-based capital allocation

- valuation of risk-bearing assets and liabilities

- risk transfer tool management

understands the spectrum of risks a.o.

- (technical) insurance risks

- market risks

- interest risks

- non-financial risks: IT, legal, environmental, reputation, operating risks

is a specialist in risk information communication

- provision of management information

- interact with regulators, rating agencies

- transparency: no black boxes

operates in a ethically and responsible manner;

has the ability to lead a team of professionals

can work and communicate effectively with people from different functional areas;

can manage multiple stakeholders

can work internationally;

can help drive behaviour changes

The important competences/skills in the three main areas in which change is necessary are summarized in the table below under: Knowledge, Communication and Attitude. A distinction has been made regarding "hard", or technical competences, and "soft", or human or relationship-oriented competences.

Soft skills	Vision Helicopter view	Power of persuasion Organisational, cultural	Integrity Proactive
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	Leadership	sensitivity Advisory skills	Cooperative Drive to realise objectives Client focused
Hard skills	Actuarial basis  Specialisation  Project leadership  Problem analysis	Verbal, writing skills  Knowledge of modern languages	Quality control
	Knowledge	Communication	Attitude

### **ISABELLE LAROCHE**

General thoughts: An actuary should demonstrated knowledge and ability to apply of the fundamental concepts of identifying, evaluating and analyzing risk.

At least in Canada, traditionally, actuaries have applied their competencies to traditional fields like Pension, Life Insurance, Investment, P & C Insurance and Group Benefits. More recently, more and more actuaries start to work in Finance, Investments and Risk management. We are now also seeing a small proportion of actuaries working in some new non-traditional jobs like Human Resources, IT, Underwriting, Financial, Claims, Marketing, etc. Finally, jobs in Risk management provide accesses to employment in firms that do not employ actuaries before.

Many employers pointed out that the actuarial profession defined itself too narrowly, while the culture of most financial organizations is changing to phase out silo thinking. Considering that we cannot expect university students to have adequate knowledge of the panoply of actuarial jobs available in the financial industry, it will be useful to consider not relying solely on a track-oriented curriculum by providing a comprehensive (technical and soft skills) tool kit to students, in order to meet a growing demand for skill versatility and transferability.

Desired competencies of actuaries can be subdivided into some subsets:

The first one I will call “traditional competencies” or technical competencies: This includes what we are used to in the categories of mathematics, probabilities, statistics..., including (but not limited to...):

- General Probability, univariate & multivariate probability distributions
- Financial Mathematics
- Corporate Finance
- Statistics & Applied statistical methods (regression and time series)
- Life contingencies
- Models (including models for dependence and extreme?)
- ...

All the material that is “classical” in the education of actuaries may not be still required for the future. Maybe some of the material can be replaced by new, more relevant material. But actuaries have always

been recognized for their expertise in the quantitative skills area. And those skills will still be required in the future.

The second one I will call additional business competencies, included:

- Microeconomics and macro economics
- Accounting
- General Business skills
- Finance
- Legislation
- Computer science
- Risk management
- Human resources

These skills will benefit actuaries regardless of the of their employer or their specialization or the job they are in.

And finally, the third one I will call special competencies (or non-technical), which can include:

- Communication
- Professionalism
- Attention to rigour
- Decision making, Ability to question findings, monitoring of results
- Negotiation skills
- Leadership

Communication and Professionalism are cornerstone of these competencies, but other competencies are also valuable.

In conclusion, a strong basis in technical fields such as probabilities, statistics, financial maths, etc is still required. But, considering the expansion of the profession, it is essential to incorporate business skills, financial skills and general risk management tools. Finally, professionalism and communication are critical and other special competencies will help.

#### **PAUL KING**

*(These brief notes are personal comments, not the view of the Institute and Faculty of Actuaries)*

Overall I agree with the thrust of what most people are saying, for a thriving future profession our educational systems will need:

- more emphasis on normative skills
- a strong emphasis on professional ethics
- an up to date and flexible technical training which maintains the core skills of actuaries as risk managers in complex systems

Clearly we need to draw a line somewhere between the competencies all actuaries should have on qualifying and those that would be expected in a “mature professional” (developed through life long learning). To me, the things that fit into the qualifying zone are:

- a set of core technical skills not far from the ones we have at the moment, but reviewed to ensure they take account of the revolution in data analytics; a wider knowledge of the commercial and financial environment (e.g. more on the functioning of banks); a requirement for some knowledge of the local regulatory environment in which they are working (alongside professional ethics embedded in all aspects of education)
- development of a deep specialist knowledge in one area of practice – perhaps one way to build an appropriate set of educational and assessment resources for a wider range of topics would be to encourage use/recognition of courses offered by other IAA member associations, along the lines of the adoption of ST9 as part of the CERA qualification by a number of associations. (As an aside, I quite like the concept of “special public interest” used by Warren in his note, as a filter for deciding what are desirable topics to offer at specialist level.)
- a set of normative skills, ideally embedded in a wider competency framework including at least communication, some level of commercial awareness, and life skills (which maybe demonstrated by the ability to study successfully for the other exams), and professionalism.

Finally, we have the thorny issue of what to take out of the syllabus as we seek to add new areas. I believe the key to this is being quite ruthless in our definition of “core”. These should only be knowledge and skills that are essential to all actuaries. Other content should be left to the specialist subjects (I have no problem if that involves some duplication across two specialist subjects).

## **HENNING WERGEN**

*Goal:*

Actuaries fulfil many roles in a broad range of environments, including insurance companies, health organizations, pension plans, risk management, government, regulatory regimes, and in other fields. They have a detailed understanding of economic, financial, demographic and insurance risks and expertise in:

- Developing and using statistical and financial models to inform financial decisions
- Pricing, establishing the amount of liabilities, and setting capital requirements for uncertain future events

**The education requirements should enable every actuary to fulfil this duties in the different areas**

*Structure:*

Actuaries need a profound understanding of economic to apply mathematical and statistical methods. Based on these methods actuaries find solutions to different tasks in their work area.

Actuarial knowledge and competence therefore has to rest on two strong pillars:

- Understanding of economics / business (in general, as well as branch specific)
- Broad mathematical foundation

Basics of business	Mathematics
<ul style="list-style-type: none"> <li>• Micro- and macroeconomics <ul style="list-style-type: none"> <li>◦ Financial and insurance market theory</li> </ul> </li> <li>• Legislation <ul style="list-style-type: none"> <li>◦ National legislation</li> <li>◦ Supervisory</li> <li>◦ Taxation</li> <li>◦ Accounting</li> </ul> </li> <li>• Computation <ul style="list-style-type: none"> <li>◦ General skills</li> <li>◦ Statistical software</li> </ul> </li> <li>• Professionalism <ul style="list-style-type: none"> <li>◦ Profession</li> <li>◦ Transparency</li> <li>◦ Business ethics</li> <li>◦ Consumer vs. company vs. supervisor</li> <li>◦ “Selling products” vs. consumer protection</li> </ul> </li> <li>• Within the company <ul style="list-style-type: none"> <li>◦ Business strategy</li> <li>◦ Leadership</li> </ul> </li> <li>• Communication <ul style="list-style-type: none"> <li>◦ How to present actuarial concepts and results (Reporting)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Mathematics <ul style="list-style-type: none"> <li>◦ Analysis</li> <li>◦ Algebra</li> <li>◦ Numerical mathematics</li> </ul> </li> <li>• Statistics <ul style="list-style-type: none"> <li>◦ i.a. estimation, data analysis, regression analysis, time-series</li> </ul> </li> <li>• Probability theory <ul style="list-style-type: none"> <li>◦ i.a. measure theory, distributions, random variables, cond. probability</li> </ul> </li> <li>• Valuation of (un)certain cash-flow <ul style="list-style-type: none"> <li>◦ Link between financial and actuarial mathematics</li> </ul> </li> <li>• Actuarial mathematics / thinking <ul style="list-style-type: none"> <li>◦ Control cycle</li> <li>◦ Pricing, product development</li> <li>◦ Reserving</li> <li>◦ Profitability</li> <li>◦ ALM, modeling</li> </ul> </li> <li>• Investment and financial mathematics <ul style="list-style-type: none"> <li>◦ Types of investment and their measurement / valuation</li> <li>◦ Interest rate</li> <li>◦ Portfolio management</li> </ul> </li> <li>• Risk mathematics <ul style="list-style-type: none"> <li>◦ Risk types and risk measures</li> <li>◦ Basics of ERM and the actuarial input</li> </ul> </li> </ul>

Of course, not all relevant categories are complete. They should give an idea of a possible structure for an education of the future. There are several links between the left side (economics) and the right side (mathematics). For example, Reporting only works with a brief understanding of the actuarial principles.

Furthermore there is a certain structure within each pillar, financial market theory and legislation come before “selling products” vs. consumer protection. The mathematical foundation (analysis, algebra) needs to be presented before financial mathematics, for example.

These two pillars should give a solid foundation for different actuarial activities. Most of the topics could be taught at university as well as by the association.

To complete the actuarial studies a specialization should take place. This could be done in different ways (paper, presentation, exam etc.). Possible areas are: Life, Non-Life, Pension, Health, Risk Management (CERA), IT, Accounting etc.

## **APPENDIX D: RESPONSES TO KEY QUESTIONS FROM TASK FORCE MEMBERS**

### **ISABELLE LAROCHE**

QUESTION 1. Are there any competencies unique to actuaries. Or is the combination of the technical /practical that makes actuaries unique?

RESPONSE. Competencies of the actuary are not unique to that profession. Some other professions fulfill some competencies of the actuary. What makes the difference is the completeness of the actuary and the capacity to put numbers on risks, to give a figure on the cost of doing or not doing something.

QUESTION 2. How much of the normative/practical element do we add as a core competency, and therefore something an education system should ensure proficiency in the skills.

RESPONSE. Even if elements like business acumen or communication are not “actuarial” competencies, they should be part of a syllabus to ensure that everybody have access to that education. Maybe a different way to achieve those element can be used, like relying on university courses.

QUESTION 3. Do we have a core element, and then a number of specializations? Are the specializations additional to becoming an actuary (at least at IAA level) or should a person have a specialization to be an actuary (maybe interesting to consider the medical profession)

RESPONSE. I will refer to Andrew’s response: “The core syllabus should require some knowledge of the practice of the main areas of financial services (Life, General Insurance, Health, Pensions, probably even banking)”. The question refers to the medical profession. Every doctor knows a little about all specialization but not completely.

QUESTION 4. If we’re adding to the core, we almost certainly need to take out. What can we take out?

RESPONSE. I think that this question cannot be entirely answered at this moment. It is preferable to wait for more development.

### **MARJON TJA**

QUESTION 1. Are there any competencies unique to actuaries. Or is the combination of the technical /practical that makes actuaries unique?

RESPONSE:

In essence, actuaries (of the future) are specialists in identifying risks and analyzing these for possible consequences and propose measures how manage and finance them in the future. We do this by applying our expertise/knowledge in broad areas, such as mathematics, statistical, econometrics, (actuarial) modeling, financing, investments, risk management. I believe that, it is the combination of these competencies that makes actuaries (of the future) unique.

**QUESTION 2.** How much of the normative/practical element do we add as a core competency, and therefore something an education system should ensure proficiency in the skills.

**RESPONSE:**

We see that our traditional work domains (insurance, pensions) are changing (even shrinking in some regions) and that the role of actuaries has started expanding outside these traditional areas, a.o.: to banking, investments, non-financials, big data etc (opportunities!). In my view we should continue doing what we do best, also in these new work fields and gain the recognition/ respect as we have in our traditional domains. We should become more 'extravert/ vocal' outside our (comfortable) traditional domains. For this, communications skills and business acumen should be more prominent in the whole education program. And naturally the basics of the new areas and how to apply what we do best in those new areas.

**QUESTION 3.** Do we have a core element, and then a number of specializations? Are the specializations additional to becoming an actuary (at least at IAA level) or should a person have a specialization to be an actuary (maybe interesting to consider the medical profession)

**RESPONSE:**

My view is that the technical core elements are pretty much the same that have made us what we are today. I do think the actuary of the future should be educated broader, allowing some basics of the new domains (specializations). I think this could be achieved by adding the risk management components in the education since these have become an integral part of overall business planning and decision making process. Further specialization can be developed while performing the actuarial profession and through permanent education program.

**QUESTION 4.** If we're adding to the core, we almost certainly need to take out. What can we take out?

**RESPONSE:**

Not sure whether it is for our group to work this out in detail. To say something about this: I think that in the core technical elements, we shouldn't take anything out, but maybe less detailed regarding our traditional domains.

#### **RAFEAL MARINO**

**Q1:** Are there any competencies unique to actuaries. Or is the combination of the technical /practical that makes actuaries unique?

**R1:** I think most of the competences are not unique of us, but it's the combination of several disciplines or areas, in one hand, and the technical and practical orientation, in the other hand, what make our profession different (unique).

**Q2:** How much of the normative/practical element do we add as a core competency, and therefore something an education system should ensure proficiency in the skills.

R2: We should include a good amount of practical elements in most of the areas. Consideration of transversal-cross work (to several areas) could be very valuable. Areas concerning environment in which products or contracts must develop (Accounting, and Insurance, Financial, Pension Plans and Social Security regulation) are also very important, and my view is that they surely have elements that must be considered in the practical elements.

Q3: Do we have a core element, and then a number of specializations? Are the specializations additional to becoming an actuary (at least at IAA level) or should a person have a specialization to be an actuary (maybe interesting to consider the medical profession)?

R3: Yes, we should have core competencies, necessary to all future actuaries. I also think it would be desirable including a specialization at IAA-level, but something which couldn't be understood as an excessive requirement.

Q4: If we're adding to the core, we almost certainly need to take out. What can we take out?

R4: Maybe competencies related to specialization should be not included in a first stage of our work. In a later stage we can decide including them or not in the core competencies.

#### **PAUL KING**

Q1: Are there any competencies unique to actuaries. Or is the combination of the technical /practical that makes actuaries unique?

Response: Although none of the technical skills actuaries have is unique to the profession, some of them are rare outside it. And the complete set of skills is essentially unique. However, it is the application of this set of skills to real world complex systems that makes actuaries unique. It is also the fact that actuaries work within a strong ethical/professional code. (This is actually beginning to feel like a definition that says actuaries are members of a traditional profession!)

Q2: How much of the normative/practical element do we add as a core competency, and therefore something an education system should ensure proficiency in the skills.

Response: We should include a set of normative skills, ideally embedded in a wider competency framework including at least communication, some level of commercial awareness and strategy, and professionalism. The qualification should include demonstration of ability to apply these skills in a practical situation, for example by an element of assessed work-based learning or case-studies.

Q3: Do we have a core element, and then a number of specializations? Are the specializations additional to becoming an actuary (at least at IAA level) or should a person have a specialization to be an actuary (maybe interesting to consider the medical profession)?

Response: I believe a specialism should be included at IAA level partly because this gives the most sensible opportunity to assess higher level skills such as problem solving and judgment.

Q4: If we're adding to the core, we almost certainly need to take out. What can we take out?

Response: This will be tricky, but we must focus on core skills for the future – not core skills for the past. Also, I don't think that the introduction of normative skills needs to be at the expense of technical skills; they should be developed in parallel

## **ANDREW GLADWIN**

**QUESTION 1.** Are there any competencies unique to actuaries. Or is the combination of the technical /practical that makes actuaries unique?

**RESPONSE.** I can't think of any competencies/areas of study completely unique to actuaries at the moment – I would think just about everything in the technical actuarial syllabus would also be known by some demographers, statisticians, quantitative financial people etc. However, the combination of the technical skills – a deep understanding of financial risk, being able to model, understanding the economic background –combined with strong (arguably should be stronger) practical skills probably create the unique nature of the actuarial profession. I do also think we shouldn't underestimate the importance of the ethical/professionalism component –particularly in these times- I believe there is considerable value in having a personal with the strong financial skillset of the actuary combined with a commitment to operate in the public interest.

**QUESTION 2.** How much of the normative/practical element do we add as a core competency, and therefore something an education system should ensure proficiency in the skills.

**RESPONSE.** I agree with earlier comments – communication is critical, and there needs to be some focus on practical/strategic business thinking. While these are generic skills, and could be taught outside a specific actuarial course, I think they should be part of the actuarial core competency, and therefore core syllabus

**QUESTION 3.** Do we have a core element, and then a number of specializations? Are the specializations additional to becoming an actuary (at least at IAA level) or should a person have a specialization to be an actuary (maybe interesting to consider the medical profession)

**RESPONSE.** My view is pretty much set out in my paper but in summary – I think the core syllabus should require some knowledge of the practice of the main areas of financial services (Life, General Insurance, Health, Pensions, probably even banking) as the key skills are more easily taught in a context, aside from the understanding that this will create in terms of the context of the profession. I believe the qualified actuary in IAA terms should be a generalist with this basic knowledge of the key practice areas, and a toolkit that can be applied in a number of contexts. One can then have various specializations which could lead to a more advanced qualification and this would be analogous to a specialist in the medical profession –this would allow the actuary to become a thought leader in those areas of specialization, which could include the traditional fields (Life, General, Pensions)as well as newer areas (ERM, Banking....)

**QUESTION 4.** If we're adding to the core, we almost certainly need to take out. What can we take out?

**RESPONSE.** This would be detail for the next syllabus review group, but I do think we can do some high-level thinking here. One would probably look to areas that specific to one practice area, rather than generic actuarial skills. There may be little scope to take out entire topics from the IAA syllabus, but , if the syllabus is better defined, the management of the scope of the actuarial syllabus would be in covering topics to an appropriate level of depth

## **HENNING WERGEN**

Q1: Are there any competencies unique to actuaries. Or is the combination of the technical /practical that makes actuaries unique?

R1: Actuaries apply mathematical / statistical knowledge to solve financial / social problems. They identify, quantify and manage risk with mathematical methods. These points are more or less unique to actuaries. Furthermore actuaries fulfil this role as academics (developing new methods), for companies (as employee) and in external roles (supervisory / consultant).

Q2: How much of the normative/practical element do we add as a core competency, and therefore something an education system should ensure proficiency in the skills.

R2: Practical elements should be included in those areas that are key to the actuarial profession (see R1). Something like an ongoing case-study (starting with calculating / reserving up to modelling) through the whole education could help to deepen and learn to apply. Supporting areas (legislation, accounting) could have reduced practical aspects

Q3: Do we have a core element, and then a number of specializations? Are the specializations additional to becoming an actuary (at least at IAA level) or should a person have a specialization to be an actuary (maybe interesting to consider the medical profession)?

R3: Yes, there should be core competencies relevant to all future actuaries. And yes, a specialization should be included at IAA-level.

Q4: If we're adding to the core, we almost certainly need to take out. What can we take out?

R4: The IAA Core Syllabus should focus on the core competencies: As a result some topics will be reduced or cut. From my point of view a specialization could be very national so that IAA will only say that a specialization with a certain work load has to be done for FQA.

## **WARREN LUCKNER**

QUESTION 1. Are there any competencies unique to actuaries. Or is the combination of the technical /practical that makes actuaries unique?

RESPONSE. My view is that there are two types of combinations that are distinctive to actuaries:

1. The combination of mathematical and statistical tools and their application to the tasks of identifying and quantifying risks in financial or other terms. For example, mortality risk, morbidity risk, asset value risk, reinvestment risk, longevity risk, etc.
2. The combination of results of those tasks of identification and quantification, with the strategic thinking, decision-making and communication skills necessary to create and implement effective programs for managing/mitigating the risks identified and quantified. For example, insurance products, financial derivatives.

QUESTION 2. How much of the normative/practical element do we add as a core competency, and therefore something an education system should ensure proficiency in the skills.

**RESPONSE.** Based on the combinations I identified above, the “normative/practical” elements that I believe should be part of the core competency framework include strategic thinking, decision-making and communication.

**QUESTION 3.** Do we have a core element, and then a number of specializations? Are the specializations additional to becoming an actuary (at least at IAA level) or should a person have a specialization to be an actuary (maybe interesting to consider the medical profession)

**RESPONSE.** The skills/competencies of using mathematics and probability and statistics to identify and quantify risk might be viewed as the core all actuaries should understand. The specialties result from using those skills to design and implement programs that manage/mitigate the risk.

**QUESTION 4.** If we’re adding to the core, we almost certainly need to take out. What can we take out?

**RESPONSE.** I believe we can wait to see how the work develops before thinking about what we should include or not include.

#### **STEPHEN EADIE**

**Are there any competencies unique to actuaries, or is the combination of the technical/practical that makes actuaries unique?**

I think the best way to answer this question is to first try to answer the question as a third-party for another profession. As an actuary, how would I answer this for a medical doctor?

I think it is the level of knowledge and skill development in a related body of work combined with the other aspects of professionalism that establishes what is necessary for one to be a medical doctor. You wouldn’t just say that someone qualifies as a medical doctor just because he works in health care. Nurses work in health care, veterinarians work in health care. You also would not disqualify a medical doctor because the doctor doesn’t normally provide surgical services. It only matters that he continues to provide medical services of some type. You also expect the medical doctor to be part of a professional group and look for his certification (especially when you first consult with the doctor).

You would need to also say that a medical doctor is trained to a minimum level in all aspects of health care, has specialized knowledge with respect to health care, is able to apply his skills and knowledge to delivery health care services, especially in the medical doctor’s chosen specialization and the medical doctor provides health care services for the betterment of society in accordance with the standards set down by the medical profession.

Therefore:

An actuary is a professional risk manager. The actuary is trained as an applied mathematician and has mastered a set of competencies related to the provision of risk management, has specialized knowledge with respect to matters related to risk management, is able to apply his skills and knowledge to delivery of risk management services, especially in the actuary’s chosen area of specialization and the actuary

provides risk management services for the betterment of society in accordance with the standards set down by the actuarial profession.

Risk management often involves skills related to data analysis and management, probability and statistics, credibility theory, numerical methods, financial mathematics, parametric and semi-parametric models (including extreme value models) and stochastic modelling.

Actuarial work in risk management is often related to practical societal, business and personal problems that must be managed over an extended period of time.

**How much of the normative/practical element do we add as a core competency, and therefore something an education system should ensure proficiency in the skills?**

Some of the normative competencies belong in the core actuarial requirements, as follows:

Every actuary should be able to communicate work results to peers, managers, clients and the public. An actuary should be able to participate effectively in debates relevant to the actuary's specialty.

Every actuary should be able to communicate material aspects of any problem and proposed solutions sufficiently well to allow informed decision making by the users of the actuary's work. An actuary should be able to participate and, at times, facilitate the decision-making process with respect to material problems in the actuary's specialty.

Every actuary should be able to apply all relevant standards of practice in preparing work. An actuary should be able to interpret and adjust existing standards of practice to fit new or emerging problems.

Every actuary should be able to manage their own work requirements effectively.

The normative skills should not necessarily be taught separately but should be integrated into some of the course work already used to teach other required competencies. Assessment of development in the normative skills should not be through traditional proctored examinations.

**MARY FRANCES MILLER**

QUESTION 1. Are there any competencies unique to actuaries. Or is the combination of the technical /practical that makes actuaries unique?

To a very great extent, I think it's more the combination than the individual skills. There's nothing in the actuarial toolkit that somebody else doesn't have in theirs. Really good actuaries, though, can take a step back and see the whole picture in ways that few others seem to be able to. Perhaps it's connected to the idea that the actuary, as a professional, is always tasked with looking out for more than the shareholders.

- a. Actuaries have both the mathematical background and the business context: they provide the bridge between the silos within an insurance operation (and can do the same in other business contexts)
- b. Understanding credibility is critical – being able to work with the issues related to sample size and model risk, the relevance of data to the problem at hand, and how to effectively use incomplete data

- c. Understanding the concept of risk within the business context is the actuary's space
- d. Professionalism is a key differentiator
- e. Communication skills – at a minimum the ability to communicate with (and persuade) other actuaries – is a growing necessity

QUESTION 2. How much of the normative/practical element do we add as a core competency, and therefore something an education system should ensure proficiency in the skills.

Professionalism and an ingrained responsibility to the “higher power” – the truth, the public, what have you – is critical to actuarial development. Actuaries who apprentice in established environments seem to me to understand this concept better than those who achieve qualification with little contact with other actuaries. I do not know how one ensures proficiency in the professionalism side of normative education.

Communication skills are important, but there should always be a place for the truly introverted actuary, who perhaps has a limited sphere of communication with only others who are technically advanced. I would be very reluctant to say for example that someone who possesses the technical actuarial toolkit but has difficulty writing well isn't an actuary.

Practical examples should be ingrained throughout the actuarial education process.

QUESTION 3. Do we have a core element, and then a number of specializations? Are the specializations additional to becoming an actuary (at least at IAA level) or should a person have a specialization to be an actuary (maybe interesting to consider the medical profession)

Yes. There is a central skillset that all actuaries should master – but I believe that the days of the Jack-of-all-Trades actuary are fast disappearing behind us. I believe that a mature member association would want to have its full qualification level include specialization beyond the core, and not all actuaries need to be prepared to practice in all of the traditional specialization areas.

QUESTION 4. If we're adding to the core, we almost certainly need to take out. What can we take out?

It may be too soon to answer this question.

**Do we have a core element and then a number of specializations? Does an actuary need a specialty to be a fully qualified actuary?**

I think we do have a core element that is very close to the current IAA syllabus with some possible changes. I recommend that we should focus on mastery of the necessary competencies at the lower cognitive levels of knowledge, comprehension, application and analysis for our core elements. I would accept mastery of the core competencies at this level as appropriate for a fully qualified actuary.

An actuary should also demonstrate mastery at the higher cognitive levels, synthesis and evaluation, in the actuary's chosen specialty. A distinction should be made between an actuary who stops at the fully qualified actuary level and an actuary who demonstrates mastery at the higher level in a specialty (e.g. Associate versus Fellow). There should be a specialty track for academics (I would argue that a PhD in a relevant area would qualify a fully qualified actuary as a specialist).

**If we add to the core syllabus, what can we take out?**

I am not sure we need to do this.

We could limit coverage for some topics by making them a little more specialized. For example, we could limit coverage of economics.

We should probably focus on defining our core competencies and topics a little more thoroughly.

**JOHN SHEPHERD AND JOHN EVANS**

**Q1 (Uniqueness):** The uniqueness of the actuarial profession is the ability to think in variance space with respect to business problems, ie it's the combination of skills that is unique, remembering that "being professional" is part of the package.

**Q2 (Core Competency):** We should ensure the core competency includes experience with business problems, which is really attempted in the Australian Part 11A courses and how to communicate difficult issues to non actuaries. If we can define the competencies then they will become the core, taking the place of the content topic lists (knowledge elements) in the existing core.

**Q3 (Core v. Specialisation):** the core competencies should be common training for all actuaries, with specialisations adding greater technical competency; possession of the core competencies can be demonstrated (in an educationally assessable way) in any one of a range of application areas (insurance, banking, pensions, etc).

**Q4 (Include/Exclude):** the core competency should consist of statistics, especially variance and dealing with inadequate data, time value of money, application of statistics to mortality and other insurance contingencies, financial services business problems, communication, finance and accounting concepts. Perhaps the core is not a quantum of knowledge to be re-sized. Perhaps "the core" means "the competencies". Then the existing core (knowledge elements) becomes the context within which the core is applied. Or the competencies (skills) are one dimension of a matrix, with application areas (knowledge) on the other dimension.