Crisis Competence - A Holistic Academic Perspective

University of Zurich, Authors and Disciplines

Alexandra Freund & Urte Scholz, Psychology; Andrea Giuffredi-Kähr & Anne Scherer, Business; Thomas Lutz & Roger Stephan, Veterinary Medicine; Frank Rühli, Evolutionary Medicine; Sebastian Scholz, History; Kaspar Staub, Evolutionary Medicine; Burkhard Stiller, Informatics; Andreas Thier, Law; Christiane Tietz, Theology; Alexander Wagner, Economics and Finance; Susanne Walitza, Child and Adolescent Psychiatry and Psychotherapy.

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a. Introduction

A crisis is never one-dimensional. Typically, it has significant repercussions not only in the area where it originated, but across several others as well. The COVID-19 pandemic is a telling example: what began as a public health crisis went on to affect global supply chains, social cohesion, and education systems profoundly.

The university, as its name implies, is the place where the whole of reality, the universe itself, becomes an object of academic enquiry. Yet each discipline necessarily narrows its focus to a particular aspect of that reality, trading comprehensiveness for methodological rigour and analytical clarity. Academic research on crises is no exception. When different disciplines engage with one another, however, their respective horizons broaden, and each begins to recognise dimensions it had previously overlooked — dimensions which bear directly on its own enquiries. The result is a richer and more comprehensive understanding of crises than any single field could achieve on its own. This paper, written by members of the Centre for Crisis Competence at the University of Zurich, Switzerland, has grown out of our interdisciplinary discourse. Drawing on our varied approaches to crises and crisis competence, we have developed a multidimensional, near-holistic perspective. To this end, each author first contributed a brief characterisation of crisis and crisis competence from the vantage point of their own field of research.[1] Second, through an iterative process of reading one another's texts and engaging in dialogue on several occasions, we gradually developed a more comprehensive and integrated view.

A multidisciplinary, holistic perspective on crises offers hope that humankind will not only face many more crises but will also prove capable of surviving them. Through its broad view of human reality, such a perspective fosters out-of-the-box thinking (4a) and strengthens crisis competence.

What is a crisis?

Each academic discipline that studies crises brings its own definition to the table. Taken together, these definitions complement one another and reveal that crises can take many different forms. And yet, certain attributes remain common to all.

[1] See the appendix; the numbers in brackets in this text refer to the respective parts of the appendix; the order there follows the order of the faculties at the University of Zurich. The highlighted quotes are also from the appendix.

A crisis from the perspective of modern economics: „a broad impact, large costs (usually quantified in monetary terms), and a focus on the downside, with little attention to potential upsides the situation might bring." (WAGNER, Finance).

"In ancient Greek, the term 'crisis' meant a situation of separation or decision, in which something can take a turn for the worse or the better." (TIETZ, Theology)

A crisis is a difficult, disruptive, endangering and often unexpected situation or time period in which the difficulties cannot be solved by usual means or familiar strategies (3b, 4a, 7). Originally, the term "crisis" (coming from ancient Greek) meant a decisive situation, especially in medicine, in which something can turn for the worse or for the better; it is a dangerous situation of severe illness in which one can either die or recover (1). Nowadays, we usually focus on the downside effect (3a). The possibility of a positive outcome, addressed in the ancient term, today is still present in the saying that there is opportunity in every crisis.

A crisis can affect an individual, a group, a whole society or even the totality of humankind (4a). It leads to large costs, be it monetary (3a) or non-monetary. A crisis can be caused by humans, be it intentionally or unintentionally (8), but a crisis can also arise without human influence. It can be provoked by an external power but can also develop from internal reasons (3b). Crises can have different magnitudes and dynamics (4a), they can be large or small – and slow-growing or fast. Crises can occur only once, but also repetitively (4a). Even if the term is reserved for a rare phenomenon, crises are actually frequent (3a).

Different phases of dealing with a crisis can be distinguished: recognising a crisis (b); responding to or managing a crisis (c); debriefing after a crisis (d); preparing for the next crisis (e). In these phases, different competences are needed as well (3b, 4a).

b. Competence in recognizing a crisis

One central aim of researching crises is the development of strategies for the early recognition of crises (5). Most crises have been brewing for a while before they at a certain point accelerate quickly (3a; 3b). The earlier you are aware of a crisis, the better you can respond to it. The example of cybersecurity teaches us that the clearer you understand where the danger is coming from, the better the countermeasures available will be (8). Evolutionary studies nevertheless warn us that human beings tend to consider only the most likely events with obvious dangers and often neglect unlikely events and non-obvious dangers (4a). This can lead to problematic judgements, as events with slightly lower probabilities can have even more devastating consequences, as climate change analyses show (3a, 4a).

„Humans tend to focus on more likely and more obvious dangers."(RÜHLI, Evolutionary Medicine)

Considering crises from the perspective of a variety of disciplines makes us better aware of the different areas that might be affected by a crisis. An example: When you think about a human disease from a medical perspective, you focus on the harm it causes to the body. Being in conversation with a historian who analyses the effects of past diseases, e.g. poverty of large parts of society, makes you aware that the current disease may also cause pauperism (6). Another example: Considering an animal disease as only

relevant to veterinary medicine, one can overlook that it could have effects on human food supply as well, if it leads to a vast reduction in certain animal populations (5).

> *"We know the obesity pandemic exists, we know its consequences, hence it is a health crisis that is in no way unforeseeable, but we have not been able to control or stop it." (LUTZ/STEPHAN, Veterinary Medicine)*

Currently, we are aware of many global crises, the climate crisis and the Russia-Ukraine war, to name only a few. Such "obvious" crises can lead to unawareness of "smaller" crises which are at first sight more individual or may develop more slowly, e.g. the obesity pandemic, but which also have large societal effects as they affect the healthcare system negatively, given the large number of people who must deal with that disease (5). This is an example of a crisis which is not at all unexpected.

If a crisis is not global in character, it is helpful to distinguish between an internal and an external perspective on recognising the crisis, as economic studies on the involved bodies, here organisations, have made plausible. While the internal perspective looks out for problems within the organisation, the external perspective pays attention to interactions of the organisation with other actors (3b).

> *"History may indeed offer valuable scenarios for how challenges were dealt with in earlier crises." (STAUB, Evolutionary Medicine).*

Especially decision-makers who are responsible for the comprehensive well-being of humans need a holistic perspective on crises. They need to be aware of historically similar situations and can therefore benefit from conversation with historians during a current crisis (4b). Big crises are sometimes linked with each other over longer time periods; see for example the link between the global financial crisis and the number of deaths in the COVID-19 pandemic (3a). Only an interdisciplinary approach which monitors constellations over a long time provides the awareness for that.

Psychology teaches us that considering something as a crisis depends on the subjective appraisal that the situation exceeds the resources available to deal with it (7). This might cause a feeling of low or no control at all over the situation (7). From this it follows that the recognition of a societal or global crisis needs an intersubjective consensus in the appraisal. This intersubjective consensus can at the same time exclude different judgements from other individuals or groups and thus ignore what others count as a crisis.

> *"A feeling of low or no control over the situation … is a typical experience during crisis." (FREUND/U. SCHOLZ, Psychology).*

> *"Legal norms can (and should) determine who and under what conditions can declare whether and what type of crisis has arisen." (THIER, Law)*

Jurisprudence reminds us that such an intersubjective consensus cannot always be achieved and that therefore a society – and the global community as well – needs legal norms which define who under which circumstances can identify something as a crisis (2). These norms include standards for the situation to be proclaimed (e.g. "special situation", "extraordinary situation"; 2). In this, law makes a certain interpretation of the situation binding for all, while at the same time remaining general, abstract and vague, to be generalisable and objectifiable (2). The concretisation of that abstract interpretation takes place in jurisdiction, which will presumably again include elements of social consensus on the crisis (2). From economics we learn that expectations and beliefs of a crisis can even provoke that crisis, as analyses of the "bank run" phenomenon have made obvious (2). These dynamics of a self-fulfilling prophecy are so fast that they are difficult to stop (2).

c. Competences in acute crisis management / in responding to a crisis

Researching the human history of crises helps us to realise the different kinds of responses humans have developed to crises (4b, 6).

> *"Humans as a species have survived many crises." (RÜHLI, EVOLUTIONARY MEDICINE)*

For successful crisis management, it is important to understand the dynamics of a crisis. Some require a swift resolution (3b), an immediate fight-or-flight response (4a). Yet in a more slowly developing crisis, more coherent, rational responses are necessary (4a). They must take long-term endurance into account (4a) and to consider organisational measures (8).

In responding to crises, human beings try to regain control and certainty. Laws are binding regulations of human actions which (re-)create certainty of expectation and make precautions for the future possible; they guide behaviour, both in the management and prevention of crises (2). They furthermore help to secure essential goods (2).

Not infrequently, humans have responded to crises by helping those fellow human beings who suffered most (1, 6). Experiencing help from others in such a situation supports overcoming a crisis: it includes practical support on the one hand and emotional support on the other, and the experience of not being alone (7). I myself might not have enough means at hand to overcome the crisis, but others have. If they share their means, these means become accessible to me as well.

> *"The coping literature started off by distinguishing between problem-focused (e.g., trying to change the situation) and emotion-focused strategies … Now there are more nuances to coping that also include meaning-finding …, or interpersonal aspects, such as social support." (FREUND/U. SCHOLZ, Psychology)*

Most of these responses to a crisis will be problem-focused and active in nature. Human beings hope that the tools in their toolbox will function to fix the crisis (3a). This perspective may underestimate the complexity (3a) or the severity (1) of some crises. Psychology makes us aware that a problem-focused strategy in which one tries to change the situation is only one attempt to deal with it. There are also emotion-focused strategies in which people accept or reframe the difficult situation (7); this re-interpretation could change the judgement that this situation is a crisis at all (1, 7).

Responses to crises must be aware that different humans have different capacities and strategies to manage crises. An individual's capacity seems to change across adulthood. Older people tend less to persist with their goals and more to interpret the situation differently (7). This difference in capacities and strategies might be seen as problematic for those who must decide on concrete measures. But evolutionary medicine makes us aware that a variety in behaviour leads to a variety in the survival rate of the individual; thus, from an evolutionary perspective a non-conformist reaction makes sense (4a).

> *"Prior studies have shown that leaders who frame crises as opportunities and adapt and change mental models in critical situations are better able to act more flexibly and open-mindedly, whereas those who perceive a crisis as a threat typically react more defensively and consider fewer innovative approaches." (GIUFFREDI-KÄHR/SCHERER, Economics).*

If a crisis affects a group, be it smaller or larger, competent leadership is crucial. Leaders should frame the crisis as an opportunity; then they will come to a more adequate reaction than if framing the crisis as a danger or threat (3b).

One essential element in responding to a crisis is communication (3b, 4a). Not everybody will come to the same judgement in terms of first the existence of a crisis and second the adequate means to overcome it. The more transparently you communicate your own judgement, the more you will be able to find alliances and solidarity for the means you suggest. Yet, a certain kind of communication can also exacerbate a crisis (3a). Adequate communication in a crisis is not only relevant internally, but also externally. Management research has shown that communication can positively influence stakeholders' perception of the crisis, something which helps in controlling the negative effects of it (3b). This might even include public apologies if somebody caused the crisis (3b).

d. Competences in Debriefing in the Post-Crisis Phase

Not every response to a crisis is adequate. A crisis might cause unreasonable panic reactions which may aggravate the situation. Therefore, an honest and self-critical analysis after a crisis is necessary. Research on crisis competence therefore analyses why certain measures were successful or why they had little or no impact (6). It evaluates whether a strategy was adaptive or not (7), whether it was functional or dysfunctional. This will help in preparing for the next crisis.

The more you think about crises, the more you become aware that your generation is not the first to handle this or that crisis, but that former generations had to undergo – maybe not identical, but somehow similar – situations (6). Religions help in remembering the successful overcoming of crises (1). This memory can give hope and confidence for future crises. Even more, surviving a crisis can lead to cultural innovation, for example, as public health became an issue after severe global diseases (4a).

> *"To allow for learning from a crisis requires an honest evaluation of what has happened" (GIUFFREDI-KÄHR/SCHERER, Economics).*

Yet, learning from past experiences of crises is only possible if one studies them extensively and systematically; otherwise trying to learn from them will be either misleading, as the solution of the past does not fit today, or will lead to the repetition of mistakes of the past (4b). A reflection on experiences of the past can also lead to the insight that the current crisis is unique (4b). To learn from past crises means to draw experiential knowledge from both differences and similarities (4b).

e. Competence in Preparing for a Crisis / in Crisis Prevention

At first sight, crises seem unpredictable. This, one might think, makes them a crisis; if we knew them in advance, we would consider them a problem, not a crisis, and we would do something to avoid them. But

if this truly were the case, then any attempt to develop crisis competence would be absurd. Humans have often tried to develop mechanisms to prevent future crises (6).

In fact, in some cases we know that crises will happen; we only do not know exactly when and to what extent (5). In these cases, developing scenarios helps (4b, 5). The basis of those scenarios is the understanding of the stability of a system which will be affected and endangered by a crisis. One must know its elements, be able to measure their states, assess an equilibrium and understand the mutual feedback between its elements (4a, 8). Management research strengthens the awareness that early warning systems should be installed to monitor the environment for signals (3b). Given the understanding of the interdependence between the elements of a system, it is possible to predict the complex effects of that danger and how best to react to it (4a). A risk analysis belongs to responsible crisis preparation (8). Processes should be defined for analysing the signals of a coming crisis and linking them to possible responses (3b). Already in advance, responsibilities and information pathways should be established (2, 3b). Through laws, individuals as well as institutions can be obliged to undertake measures for prevention and for ensuring stability in the event of a crisis (2).

"The knowledge of systems, their complexity, interaction modes, and operations can help to prevent crisis in case of cybersecurity attacks" (STILLER, Informatics).

Any awareness of potential threats helps to increase our competence to deal with future crises (4a). Mindfulness is important, in which one is preoccupied with possible failure and rejects simplification (1).

Of course, risk analysis also has its limits: in economics, the term "risk" refers to an ex ante analysis of a decision in which every possible outcome has a certain probability. Risk must be distinguished from true "uncertainty" in which either the probabilities of possible outcomes are unknown, or the outcomes themselves are unknown (3a, 3b). Given the complexity of most situations, it is unlikely that a person can adequately calculate every event and its probability (3a). This insight does not negate that in most cases; economic crises are predictable and do not occur randomly (3a). As many crises lead to large costs, financial markets can serve as indicators or crystal balls for looming crises, even for those outside economics (3a).

"Thus, even though crises are not rare per se …, a given crisis can still be a rare or neglected event." (WAGNER, Finance)

Appendix

1. *Theology: Including Crises in a Comprehensive Understanding of Human Life (Christiane Tietz)*

In ancient Greek, the term "crisis" meant a situation of separation or decision, in which something can take a turn for the worse or the better. The Church Father Augustine described it as the situation of "an increased danger", in which one can come "from sickness unto health" (Augustine 1914, 106) – or die from it. A crisis can be experienced as a chance to act, but also as something which happens to human beings (Koselleck 1976).

Religions try to handle the negative and positive, active and passive dimensions of crises, as they refer to all basic challenges of human life, to human suffering and well-being, to life and to death. Religions attempt to include crises within their comprehensive concepts of human life, which they understand as being in relation to God or the transcendent. Theology reflects critically on religious practices and concepts.

Critics of religion such as Marx, Freud or Nietzsche argued that religions hinder human beings from responding to crises. They considered religion, with its hope for a better transcendent world, "the opium of the people" (Marx 1981, 378). They viewed religion as "the imaginary flower on the chain" (ibid., 379), with which human beings accept oppression. This might well be true. But one can also observe that religions help people to respond to crises, as they strengthen human action and human hope.

First, religions have developed ethical concepts of how to help people in crises (e.g. Roser et al. 2022). They argue that human beings are called upon to help one another, not only incidentally, but grounded in ethical norms which humans should follow. Religions have not only established those norms, but have also encouraged people to accept challenges and to make courageous decisions in situations of crisis.

Second, religions tell stories of human survival of crises. In annual feasts, for example, they celebrate the memory of these survivals. As survivals are interpreted as having been made possible by the – be it outer, be it inner – help of God (or Gods), crises lose some of their threatening character. When religions understand God as governing the world, the contingent character of crises may be diminished. This encourages hope that any crisis can be survived.

Third, religions address aspects of healing after having suffered a crisis. In leaving room for the wounded and the lamenting, they provide a safe space for recovery. They nurture the awareness that those who were not successful in a situation of crisis are also human beings with human dignity, and strengthen the recognition that humans are vulnerable beings (Richter 2021).

Interpreting crises through a religious lens may be helpful in situations of crisis. But religion can also give rise to further crises. Major worldly crises (e.g. the horror of the Shoah) cause profound crises of faith and challenge the believer's understanding of God. Where is God in such a crisis? Is God causing (or at least allowing) that crisis? Is God truly good? Does faith in God and hope for God's help make any sense? Does God exist at all? Theology critically discusses answers to these questions (Kreiner 2005).

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2. *Law and Crisis (Andreas Thier)*

"Law" can be interpreted in its entirety as a sum of norms claiming enforceable bindingness. In connection with the relationship of law to "crises", an essential social function of law comes to the fore: law brings about the binding regulation of human action by means of commandments and prohibitions, and by establishing status relationships for persons – for example, in the form of "marriage" – and things – for example, by qualifying them as "property". By making such rules generally binding through legal norms and their application, law creates certainty of expectation, makes future dispositions possible, and is the basis for social peace. At the same time, law is always an expression of collective interpretations and evaluations of the world and of human social relations. Against this background, two functions of law can be identified in the context of crisis management and prevention: law is used to guide behaviour and to organise institutions and procedures in the management and prevention of crises (see below). Law also participates in the collective interpretation of the phenomenon and situations of crisis, the identification and description of which is objectified and made binding by law (see below).

In both situations of crisis development and for their prevention, it is necessary to establish rules for the behaviour of people and for the actions of organised associations. These rules must be binding and reliable for all participants. This also includes the definition of powers to act, responsibilities, and procedural rules before and during situations of crisis. Typical examples of this are the regulations of the Swiss Epidemics Act (Systematic Collection of Laws [SR] 818.101) and the so-called COVID-19 Act (SR 818.102): Thus, Art. 1 para. 1 of the COVID-19 Act establishes the institutional responsibility of the Swiss Federal Council, and in particular the special powers of the Federal Council to combat the COVID-19 epidemic and to respond to the effects of the measures to combat the disease on society, the economy, and the public sector (https://www.fedlex.admin.ch/eli/cc/2020/711/en – official translation). The enumeration of possible orders, for example in relation to healthcare provision in Art. 3 of this Act, corresponds to this, as the Federal Council is authorised to require manufacturers, distributors, laboratories, healthcare facilities, and other cantonal facilities to report their stocks of therapeutic products, protective equipment, and other medical goods required for healthcare provision (essential medical goods). At the same time, such regulations demonstrate the particular importance of legal norms in crisis situations regarding the allocation of essential goods. Typical individually oriented rules of conduct for situations of epidemic or pandemic crisis can be found in the form of measures that apply to individual persons (chapter 5, section 1 Epidemics Act – English translation of the Federal Government, https://fedlex.data.admin.ch/eli/cc/2015/297). In many cases, however, legal rules for the prevention and management of crises are also directed at non-sovereign

institutions, such as actors in the financial market, and oblige them to take crisis-prevention measures. This becomes particularly evident in Art. 24 para. 1 of the Financial Market Infrastructure Act (SR 958.1), according to which "a systemically important financial market infrastructure shall draw up a recovery plan that sets out the measures it will use to ensure its stability on a sustainable basis in the event of a crisis and be able to maintain its systemically important business processes" (official translation – https://fedlex.data.admin.ch/eli/cc/2015/853, emphasis not in original). While the definition of "crisis" in this provision is evidently left to the interpretation of legal practitioners and legal scholars, legal norms can (and should) determine who, and under what conditions, may determine whether and what type of crisis has arisen. This can be seen, for example, in Articles 6 and 7 of the EpG, where the prerequisites of a special situation and an extraordinary situation are codified and, at the same time, the resulting powers of the Federal Council are determined.

Legal norms render interpretations of the world binding. This is not infrequently the case in crises, but it remains to be examined in detail and, in particular, in its historical development. In the context of law-making and the application of law, it is less a matter of abstract descriptions of "crisis". Rather, the interpretations of crisis-like developments depend on regulation. Typical are again the regulations in the context of epidemic crises, as in Art. 6 para. 1 lit. a. EpG, where the special situation is linked to the fact that the ordinary enforcement agencies are unable to prevent or control the outbreak and spread of communicable diseases, and one of the following risks is present. However, the description of these risks is again dominated by very open-ended terms such as "special risk to public health". It is precisely such vagueness that illustrates the limits of the possibilities of describing crises through law: legal norms must remain abstract to be generalisable and objectifiable. Therefore, they can only describe general elements of a crisis. Concretisation is left to the application of the law, in particular to case law. For its part, case law will presumably attempt to incorporate elements of social consensus on the perception of crises into its interpretation of "crisis", or to have recourse to specialist expertise. But this, too, remains to be examined in greater detail.

3. *Economics Finance, and Management*

a. *Crystal Balls & Broken Banks: The Predictable Unpredictability of Economic and Financial Crises (Alex Wagner)*

The global financial crisis of 2007 to 2009, the Eurozone crisis from 2009 to the mid-2010s, the climate change crisis, the COVID-19 crisis, the Russia-Ukraine crisis, the inflation crisis, not to mention countless individual corporate crises due to poor operational performance or outright fraud: this list (covering, somewhat remarkably, only the last 15 years!) illustrates that a wide range of phenomena are frequently described as crises in economics and finance, and that, as such, crises are frequent. There is no single definition of what constitutes a crisis from the perspective of social scientists. Some obvious elements of when a situation is arguably considered a crisis are: broad impact, large costs (usually quantified in monetary terms), and a focus on the downside, with little attention to potential upsides the situation might bring. However, as can be seen from the list, it is not the case that a crisis per se must be sudden (almost all of them brew for a while before escalating), though they tend to accelerate quickly once they go beyond a certain point. Going beyond these points, there are several deeper features that arguably characterise the economic analysis of crises.

First, the beliefs and expectations of market participants play a major role. For example, the classic "bank run" phenomenon (e.g., Diamond and Dybvig 1983) illustrates how a critical situation arises because market participants (in this case bank clients) believe that a negative situation (in this case the inability of the bank to repay depositors) will arise, and in equilibrium everybody is better off trying to (literally) run and withdraw money from the bank, even though everybody recognises that this will exacerbate the situation. Similarly, the literature studies "fire sales", i.e., situations in which (institutional) investors seek to (or effectively have to) sell assets faster than their peers, thus driving down asset values below their fundamental value, further leading to a downward spiral as traders must liquidate additional positions, and so on. A challenge is that developments such as these can happen very quickly and once set in motion, are very hard to stop. The events of 2023 surrounding Silicon Valley Bank and Credit Suisse, though driven by very different fundamental reasons, exemplify this phenomenon.

Second, financial markets can serve as indicators of looming crises, that is, as crystal balls. This is because the value of an asset is given by the present value of its future expected cash flows. Consider the simplest example of an asset that pays off 110 next year if the economy is doing well, and 90 if it is in recession. What market participants are willing to pay for this asset indicates how likely they perceive the two outcomes to be. If recession is considered likely, the price will end up close to 90, for example. Of course, reality is much more complicated because the cash flow that will be received in boom and recession is also uncertain, and there are many future years, not just one. But the remarkable thing about financial markets is that they provide a view of all these factors, summarising them in one variable, the asset price. This insight, first crystallised by Schwert (1981), can be applied in many instances. For example, some researchers have used it to infer from the stock price reactions of thousands of stocks around the world following the Russian invasion of Ukraine that the transition to the low-carbon economy is likely to slow down in the US, but retain its speed or accelerate in Europe (Deng, Leippold, Wagner, and Wang 2023). As such, asset prices provide important insights for policy-makers seeking to gauge the severity of a situation. Authorities charged with maintaining financial stability (such as central banks) therefore seek to monitor markets for early signs of crises. This can be a race against time and also a challenge of communication: if policy-makers see warning signs, drawing attention to those signs may, as suggested above, actually exacerbate the situation, making the crisis a self-fulfilling prophecy. If they do not warn, then they may be criticised for it after the fact.

Third, when thinking about the ability of asset prices to foresee the future, one must keep in mind that there is an important conceptual distinction between risk and uncertainty. Risk refers to the notion that, ex ante, a decision-maker recognises that a range of possible outcomes can occur, where each outcome has some probability (and all probabilities sum to one). By contrast, true uncertainty occurs when the probabilities are unknown, or when the possible events (and, therefore, their probabilities) are unknown. It is of course difficult to keep in mind, at each point in time, all the possible positive and negative events that might occur, and to assign them appropriate probabilities. Thus, even though crises are not rare per se (as the introductory list suggests), a given crisis can still be a rare or neglected event. This is evident when reviewing, for example, the Global Risk Report issued by the World Economic Forum every year. In the report published in mid-January 2020 (a few weeks before the COVID-19 pandemic erupted), infectious diseases and pandemics essentially did not feature as a major risk. In the report published in January 2022 (a few weeks before the Russian invasion of Ukraine), war and geopolitical confrontations essentially did not feature. Recent theoretical work has exploited this notion of neglected risks (Gennaioli, Shleifer, and Vishny 2015). Intuitively, once an event that was not considered possible does occur, overshooting in reactions can follow, leading to severe crises.

Fourth, a major concern in the literature is that the default assumption regarding the distribution of possible uncertain outcomes – the normal distribution – is extremely powerful, but not reflective of the true nature of some risks. A prime example is climate change. Intuitively speaking, what society needs to worry about are the extreme outcomes, the "fat tails". Recent occurrences of unusual heat, both on land and in particular in the oceans, are arguably only beginning to highlight the consequences of such developments. Even slightly higher probabilities of terrible outcomes than assumed under the normal distribution lead to substantially different conclusions, making heavy policy interventions to avoid those outcomes economically justifiable (Weitzman 2009).

Fifth, crises tend to be seen by economists as predictable phenomena, rather than as unpredictable ad hoc occurrences. There is a certain tension in this statement because economics and finance simultaneously tend to operate under the assumption that if something is predictable it would already be reflected in prices and actions today and would, therefore, not lead to extreme outcomes. In particular, one key insight of the literature (see Sufi and Taylor 2022, for a survey) is that financial crises are predictable, with growth in credit and elevated asset prices playing an especially important role. The negative consequences of a crisis are due both to the crisis itself and to the imbalances that precede it. In other words, crises do not occur randomly, and, as a result, an understanding of financial crises requires an investigation into the booms that precede them. Arguably, this insight may apply more broadly to other crises as well.

Sixth, the question of how major crises are linked with one another over perhaps longer time periods has received relatively little attention. Some studies do consider this important possibility. For example, the global financial crisis has been linked to the COVID-19 pandemic; regions and countries that suffered more during the crisis had worse public health provision a decade or more later, and thus more COVID-19 deaths (Moreno, Ongena, Ventula, Veghazy, and Wagner 2023). There is much concern among policy-makers, central bankers, and practitioners about how the energy transition and climate change crisis can impact financial stability. In particular, with fossil fuel assets risking becoming "stranded", companies and financial institutions exposed to those assets may suffer sudden and severe losses in value. In the other direction, poor financial management, particularly in banks, can in turn dramatically affect the energy transition. As the 2023 banking crisis began to unfold, stocks with greater opportunities in the transition to a low-carbon economy performed worse; that is, the market appears to anticipate that stress in the regional banking sector will curtail climate technology development (D'Ercole and Wagner 2023). Given the narrow timeline that humanity appears to have for addressing climate change, the real costs of such a financial crisis would be enormous.

Finally, the economics and finance approach to crises tends to be a fairly technocratic one; that is, there is a pronounced, sometimes implicit belief that crises can be "fixed" by suitable interventions. Thus, "crisis competence" is arguably considered high when policy-makers are deemed to have the right tools at their disposal. It is noteworthy that the belief that crises can be avoided or fixed by certain interventions stands in stark contrast with the observation that there is such a plethora of possible factors explaining a given crisis (and that presumably all those factors also interact with one another).

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b. *Mastering the Storm: A Managerial Perspective on Crisis Definition, Detection and Competence (Andrea Giuffredi-Kähr & Anne Scherer)*

An organisational crisis can be described as "an unpredictable event that threatens important expectancies of stakeholders related to health, safety, environmental, and economic issues, and can seriously impact an organisation's performance and generate negative outcomes" (Coombs 2015, 3). However, although the event is highly salient to managers and has the potential to disrupt the organisation (Bundy/Pfarrer/Short/Coombs 2017), the degree of crisis responsibility that can be attributed to the affected organisation may vary (Coombs 2004). On the one hand, organisations may be victims of crises driven by external forces beyond their control, such as outside rumours or the coronavirus pandemic. On the other hand, organisations may face a crisis that can be attributed to their own action or inaction. Such (in-)action by the organisation can be unintentional, as may be the case with many product failures, or it may be intentional, such as Volkswagen's deception in diesel engine tests which came to light in 2015 ("Dieselgate", Reuters 2021). The level of crisis responsibility that can be attributed to an organisation also determines its response to managing the crisis (Ki/Nekmat 2014). Such response strategies typically aim at positively influencing stakeholders' perceptions of the organisation and taking adequate action to contain the impact of the crisis (Bundy/Pfarrer/Short/Coombs 2017). For example, during the coronavirus pandemic many retailers provided justifications for product shortages or longer delivery times, stressing outside factors to placate disgruntled customers. Organisations facing (unintentional) product failures – such as Samsung in 2016, when batteries in their Galaxy Note 7 overheated and sometimes caught fire (Moynihan 2017) – often assume greater responsibility and apologise publicly, provide explanations for the failure, and even recall affected products to avert further reputational damage.

In order to manage a crisis effectively, however, an organisation should not only take an external perspective that focuses on organisational interactions with external stakeholders, but also focus on within-organisation dynamics such as how risks, complexity, and technology are managed (Bundy/Pfarrer/Short/Coombs 2017). Thus, leadership plays a crucial role in organisational crisis management. Prior studies have shown that leaders who frame crises as opportunities and adapt and revise their mental models in critical situations are better able to act flexibly and open-mindedly, whereas those who perceive a crisis as a threat typically react more defensively and consider fewer innovative approaches (e.g., Barr 1998, Brockner/James 2008, Dane/Pratt 2007). For example, the food service industry was heavily impacted by the pandemic due to lockdowns and restrictions on in-dining food services. However, a number

of restaurateurs who were quick to adapt their business model began collaborating with food and meal ordering services such as Uber Eats, Menufy, or Grubhub, and actually did more business during the pandemic than before (Eng 2020). Apart from leaders' crisis framing and mindset, other important leadership competencies during crises include coordination and effective communication – for example, to create an emergent response group in order to bring together knowledge, people, resources, tasks, and technology for rapid deployment in response to sudden and slow-onset crises (Majchrzak/Jarvenpaa/Hollingshead 2007; Roberts/Madsen/Desai 2007).

Although some crises occur as a surprise and cannot be foreseen, many crises can be prevented through early warning systems that monitor the internal and external environment for signals of an imminent crisis, such as process control systems, plant and equipment monitoring, social media monitoring systems, management information systems, and environmental scanning systems (e.g., Hansen/Kupfer/Hennig-Thurau 2018; Mitroff/Shrivastava/Udwadia 1987). Upon detection of anomalous signals, such systems alert managers to their appearance, who will then analyse those signals in terms of internal and external threats and how they would affect the organisation (Appelbaum/Keller/Alvarez/Bédard 2012). For example, monitoring several consumers complaining about a product failure on social media can allow managers to act and resolve the problem before it escalates into a full crisis. However, to take the necessary actions, planning processes with clear responsibilities and information pathways, technologies that document and enable information and decision processes, and actual crisis simulations and training are crucial (Jacques 2010). Such clear responsibilities and information pathways can help to avoid systemic failure in which early warning signals are ignored, as was the case with Société Générale, which lost $7 billion due to a rogue trader; an investigation found that the bank had failed to act on 75 red flags (Clark 2008).

To act proactively in preventing a crisis, issue management has also become more important (Jacques 2010). As the last few decades have shown, a large proportion of organisational crises are not triggered by emergency events such as fires, but by social and political developments. For example, pasta maker Barilla faced a boycott launched by gay rights activists in Italy after its chairman said he would only portray the "classic family" in Barilla advertisements and would not depict a gay family (Davies 2013). In detecting and responding adequately to emerging trends or changes in the socio-political environment, issue management can help to draw attention to such developments and determine an appropriate organisational stance and response.

Finally, in the post-crisis phase, learning from the crisis and developing organisational capabilities beyond the crisis event are crucial elements in managing and, potentially, preventing a future crisis (e.g., Lampel/Shamsie/Shapira 2009). However, the extent to which learning from such rare events occurs can vary dramatically across organisations. One of the most significant barriers to effective crisis management and learning is denial (Mitroff 2004), as in the case of the above-mentioned example of Société Générale. Enabling learning from a crisis requires an honest evaluation of what has happened, along with open monitoring, analysis, and information flows that reach decision-makers at the top.

Overall, the crisis management of an organisation can be considered effective when operations are sustained or resumed, losses for the organisation and external stakeholders are kept to a minimum, and learning occurs such that the organisation can apply the lessons learned in future crises (Pearson/Clair 1998).

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4. Medicine

a. Evolutionary Medicine: Crisis management: Tempora (non) mutantur… (Frank Rühli)

A crisis is a major disruptive situation which is often unexpected, either in its true impact or its dynamics. It may affect an individual, a group, or our whole society. To increase resilience at an individual but also community or societal level, knowledge of potential threats and how best to cope with them is critical. This is true not only today in our highly technologised society, but was also the case in our common past.

Humans as a species have survived many crises. A major crisis can act – biologically speaking – as a selective bottleneck, but also as a trigger for cultural innovation. Examples of past major crises of global importance are the Black Death in the 14th century CE and the "Spanish Flu" in 1918, both of which resulted in millions of deaths. Public health as a discipline was triggered particularly as a reaction to the devastating 1918 pandemic. Historically and prehistorically, other crises besides pandemic events have influenced human populations too, such as major shifts in climate.

When considering possible crises in a particular system such as that represented by mankind, it is important to identify the major elements of this system, design ways of measuring their states, assess the expected equilibrium, and understand the mutual feedback between all elements of the system. It thus follows that a crisis is a situation in which some events produce a series of further events that endanger the stability of that very system even further. A biological system consists of multiple parts – often directly and indirectly interrelated – and is more than just the pure sum of its parts. Thus, an impact on one of its parts usually has consequences for the others, in both predictable and potentially unpredictable ways. This is of particular importance when considering crises affecting larger entities such as populations, and also influences how best to tackle these complex challenges.

Generally, the study of crises and their management encompasses many aspects: crises occur in different magnitudes and with different dynamics, singularly or even repetitively. Thus, a cycle of crisis management with a certain order can be defined: crisis prevention, awareness and preparation, acute crisis management, crisis management debriefing, prevention of a new crisis, and so forth. These segments usually occur in chronological order, yet can run in parallel or become displaced when multiple crises overlap. For each of these major phases, historical and evolutionary insights help to address its main challenges.

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First, the most likely future crisis: humans tend to focus on more likely and more obvious dangers, this being driven again by evolutionary experience. Thus, one often neglects unlikely (yet still possible and potentially devastating) events. To invest in a very unlikely – even if potentially major – threat makes little sense for most of a population; it is a waste of limited resources. Human behaviour even in modern crises is shaped by such an evolutionary legacy. Yet one can still expect that not all members of a particular community will act in the same – often predictable – way, thus leaving room for behavioural (and thus survival rate) variety. A completely uniform reaction to a threat may not be the best course of action, owing to its lack of adaptive flexibility. Therefore, non-conformist reactions in a crisis are not necessarily detrimental. In a more holistic evolutionary perspective, such reactions are not only predictable and explicable, but sometimes even make sense.

Another aspect would include the reaction related to a most imminent or already developing crisis. Humans are evolutionarily primed to react to danger: if the threat is very acute, this may manifest as the classic "fight-or-flight reaction" (Cannon 1915, 211), which has been described since Antiquity (Galassi, Habicht, Rühli 2016; Galassi, Böni, Rühli, and Habicht 2016).

In crisis management, much depends on the underlying dynamic of the danger. However, often a massive, consistent, and quick response would be most desirable, as shown e.g., for the 1918 flu (Markel, Lipman, Navarro, Sloan, Michalsen, Stern, and Cetron 2007). This refers to a certain extent to the mentioned *flight-or-fight* response which means that even before one really starts “thinking” a decision in either direction is taken in an urgent situation. If one faces an imminent danger this certainly is a good way to act, for more slowly developing crises this is obviously not the best. A more consistent, rational action is then desirable, taking many aspects into account. But even in such longer lasting, slower developing crises one can see that humans tend to act more in the fast aka irrational way.

To achieve competence in handling an ongoing crisis again it helps to take insight from the past into consideration. A sustainable way to handle crisis shall include consistent, steady communication and a handling which takes long-term endurance (manpower, infrastructure) into account. This is particularly necessary for people involved in critical organisations and processes. Resilience means to have enough reserve at any point.

Finally, for the crisis management debriefing phase, all the above-mentioned factors are to be considered. The study of evolutionary behaviour can provide many more such aspects for each of these phases. To summarise, evolutionary perspectives help to consider crises holistically, to promote out-of-the-box thinking (Rühli, Eppenberger, and Henneberg 2020), and potentially to manage crises more effectively.

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b. Evolutionary Medicine: History and Epidemiology (Kaspar Staub)

The overall goal of the Anthropometrics and Historical Epidemiology Group at the IEM is to make a decisive contribution to clarifying what knowledge gained from past pandemics and epidemics could be valuable for future crises. Whenever a new crisis occurs, interest in historical contextualisation increases. This was exactly the case during the COVID-19 pandemic: public interest in previous pandemics was greater than ever (Staub and Floris 2021). History may indeed offer valuable scenarios for how challenges were addressed in earlier crises (Mooney 2021; Mamelund 2021; Haldon, Eisenberg, Mordechai, Izdebski, and White 2020). However, the recent pandemic has revealed a glaring gap: the experiences from past pandemics and epidemics are too little studied and only unsystematically so. Consequently, historical science cannot provide "evidence-based" guidance for pandemic management, and thus runs the risk of misinforming the present. Moreover, much valuable information and data lie dormant in archives and libraries.

Our work has shown that had the past been better addressed, pandemic management would have been better informed in 2020. Using novel Swiss data, we have shown that in autumn 2020, with the decentralised and hesitant approach of the authorities, the mistakes of 1918 were repeated (Staub, Jüni, Urner, Matthes, Leuch, Gemperle, et al. 2021), and that pandemic autumn waves rise one to two weeks after the seasonal drop in temperature at the beginning of October (as occurred in 1918, 1957, and 2020) (Staub 2021). We connect to the vulnerability concept (Krämer 2016), which has been widely discussed in crisis research (Füssel 2007; Wisner, Blaikie, Cannon, and Davis 2014): a society at a certain time and place is threatened by a triggering event. It is crucial to analyse what disturbances the system is exposed to, how these affect the system, and how the system responds to those disturbances. Within the "exposure" category, it is important to investigate how a society is exposed to the threat (Krämer 2016). Within the "coping/resilience" category, the different ways in which a society can cope with the disruption or learn from it are central. The aim is to minimise future risks, to adapt, and to increase resilience.

This makes "learning from the past" (or not?) an important component and raises the question of whether a new crisis is unique or whether previous worst-case scenarios may repeat themselves (Tanner 2011). History does not provide universal rules that remain constant across time (Condrau 2020; Peckham 2020; Pineo 2021). We define "learning from the past" as drawing experiential historical knowledge from both similarities and differences (Morens, Taubenberger, and Fauci 2021). The past holds scenarios and warnings that can be adapted to new challenges and contexts. For this learning from the past to work at all, there must be a transfer from historians to policy-makers. Berridge (2018) strongly advocates that history as a discipline should have a seat at the policy table, adding dimensions that others cannot. Present situations are not usually the same as those of the past, but historians have been active in researching the past and in drawing out its implications for the present. Public health policy is frequently cited as one of the

areas where historical input is particularly valuable in strengthening evidence-based health policy-making (Berridge 2008).

We are working towards our goals by digitising and making accessible previously inaccessible archival data from the last 150 years, contextualising it with qualitative background information, then analysing these diverse data with modern quantitative methods, thus building a bridge between the past and the present.

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c. *Child and Adolescent Psychiatry and Psychotherapy: Mental Health Crises in Childhood and Adolescence (Susanne Walitza)*

Psychiatry is usually engaged to support medical and mental conditions that mostly require intervention. Psychiatric crises and psychiatric emergencies are acute medical conditions that can appear across the whole lifespan. Psychiatric emergencies often require immediate intervention to support the individuals affected and, in the case of minors, the child and family. Particularly acute and increasingly common psychiatric emergencies include suicidality, self-harm, externally directed aggressive behaviour, agitation, and anxiety states. Psychiatric crises are also characterised by the loss of the patient's individual coping strategies or by the loss of a sense of control over managing the present and future situation. Different pre-existing vulnerabilities increase the likelihood of individual crises developing. Very frequent vulnerabilities include pre-existing mental and psychiatric disorders (such as anxiety and depression), lower socio-economic status, social conflicts, loneliness, and lack of family support.

Crises in children and adolescents are furthermore characterised by the influence of age-specific vulnerabilities. In childhood, crises are related to dependency on the family and parents. If parents or teachers are themselves overburdened and limited in using their own coping strategies, children are affected in a twofold way. Children and adolescents are not as experienced as adults in using coping strategies. Most situations are new to them, and they have no, or only few, memories of having successfully managed a crisis. In childhood, and especially in adolescence, neurobiological, hormonal, and brain changes, as well as challenging developmental tasks, interact with one another and require further strategies to integrate all experiences and one's own reactions. Brain maturation continues at least until the age of 25; compensatory strategies are generated mainly in the frontal lobe, which is the last brain region to mature. Finally, the duration of a crisis plays a role in the development of children and adolescents. A one-year crisis in a five-year-old child, or one occurring within a three-year period of education in an adolescent, represents a much longer interruption of normal development than it would for an adult. Interventions for children and adolescents must address all these different developmental aspects.

Over the last ten years there has been a sustained increase in reported mental and especially stress-related disorders in children and adolescents, not only in Europe but also worldwide. Furthermore, a direct influence of the COVID-19 pandemic on the increase of severe stress-related disorders in childhood was detectable. Various studies found a significant increase in psychiatric service use, as well as in reported serious mental health symptoms such as suicidality and self-harm behaviour in help-seeking children and adolescents during the pandemic (Berger et al. 2022). In a representative longitudinal study, perceived stress

and pre-existing psychiatric problems were significantly linked to all mental health outcomes. Parents' poor relationships with partners during the lockdown were associated with increased anxiety symptoms in their children (Mohler-Kuo et al. 2021). Where children and adolescents used positive cognitive restructuring to cope with stress, this was associated with fewer symptoms of anxiety, depression, and attention deficit hyperactivity disorder (ADHD), whilst negative coping was associated with more such symptoms, even one year after the lockdown (Foster et al. 2022). A gender effect was observed in crisis-related behaviour. Girls appear to have been more affected by the pandemic than boys, showing not only more internalising but also an increase in externalising symptoms. On the other hand, females more frequently employ positive and social coping strategies. There are many reasons behind this phenomenon, and gender medicine should be considered in understanding crisis management. As a positive outcome of the lockdown, we found that the lack of opportunities led to a reduction in alcohol consumption among young people. One important lesson learned from both the pandemic and the Ukrainian crisis is that healthcare and educational professionals, including school staff, should work closely together to identify high-risk adolescents with negative and avoidant coping strategies, and to train young people to use positive coping strategies.

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5. *Veterinary Medicine – the Link between Humans, Animals and the Environment (Thomas Lutz/Roger Stephan)*

Veterinary medicine is central to guaranteeing the health and wellbeing of animals, but it is also intimately linked to human and environmental health – for example, by providing healthy food to a growing world population in an environmentally sustainable way – one health in its proper sense. Within this system, the early recognition of crises and the appropriate response to them are vital. Crises can be wholly unpredicted and unforeseeable, but in certain cases they are foreseeable; that is, we know that they will occur, we just do not know when or to what extent exactly. Hence, we must increase preparedness and plan appropriate scenarios. Some animal diseases fall into the latter category. They may not cross a species barrier and are therefore not directly dangerous to human health, but they may be detrimental to large populations of animals. The lack of inter-species transmission may result in limited awareness in the general population

and – more dangerously – in politically relevant bodies, so that their significance may be underestimated. This is a situation in which specific knowledge in our field must be used to prevent, as far as possible, the consequences of such a scenario, by addressing all aspects of recognition of the situation and the appropriate response to limit those consequences. One example is the ongoing spread of a viral disease in pigs, African swine fever (You, Liu, Zhang, Zhao, Dong, Wu, Wang, Li, Wei, and Shi 2021). This disease has, for example, led to the death of hundreds of millions of pigs in China, either due to the highly lethal disease itself or due to sanitary measures to limit its further spread, which typically means the preventive culling of large numbers of animals. With pigs being one of the major sources of protein for the Chinese population, the disease has direct consequences for food supply in China. However, the problem is not localised, as the disease continues to spread and has reached our neighbouring countries (https://www.fli.de/en/news/animal-disease-situation/african-swine-fever/). Hence, the potential for a serious crisis in Switzerland exists, but the involvement of all relevant stakeholders may help to reduce its potential implications.

Even if it may sound paradoxical, non-communicable diseases can also occur in pandemic proportions. One of the most pressing examples is the obesity pandemic (Jaacks, Vandevijvere, Pan, McGowan, Wallace, Imamura, Mozaffarian, Swinburn, and Ezzati 2019). We know it exists, we know its consequences; hence, it is a health crisis that is by no means unforeseeable, yet we have not been able to control or stop it. Are we incompetent? I do not think so. Despite all the knowledge about the pathophysiological mechanisms leading to the disease, the immediate consequences for a given individual may be rather minor, which reduces awareness of the gravity of the problem and may contribute to the growth of this worldwide health problem that critically affects our healthcare systems. Hence, raising awareness among the public and decision-makers, together with continued research into the underlying pathophysiology leading to individualised treatment options, will help us address crises of worldwide occurrence. Ultimately, collaborations within a network of clinical partners will help develop prevention strategies, which should be the ultimate goal.

Another example of a silent pandemic is antimicrobial resistance (AMR). Antibiotic resistance (AMR) is a growing problem, threatening to compromise the achievements of modern medicine. Many experts warn that humankind may soon face the beginning of a post-antibiotic era characterised by untreatable bacterial infections. The situation is such that (i) the World Health Organization (WHO) has called AMR "a serious worldwide threat to public health" (http://www.who.int/mediacentre/news/releases/2014/amr-report/en/), and (ii) re-insurers as well as the World Economic Forum (WEF) ranked AMR as the fifth most serious among global societal risks in 2014 (http://www.swissre.com/about_us/managing_risks/Global_Risks_Report_2014.html). AMR impairs the therapeutic efficacy of antimicrobials. Microbial pathogens have several general strategies for becoming resistant, and the resistance factors usually have a genetic basis. The resistance genes may be inherent properties of defined microorganisms or may be located on mobile genetic elements that are transferable. Transferability greatly promotes the global dissemination of resistance under the selective pressure exerted by the use, overuse, and misuse of large amounts of antibiotics. Despite the knowledge about antibiotic stewardship and the molecular mechanisms leading to the spread of AMR genes, the immediate consequences for a given individual may be rather minor which, similar to what has been said above, reduces awareness of the gravity of the problem. This dissemination of AMR crosses species barriers; hence the need for close collaboration between human and veterinary medicine. Measures to combat AMR must be planned and implemented through a One Health approach, including environmental sciences, based on the already existing silent crisis.

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6. History: Perspectives on the Issue of Crises in the Early Middle Ages (Sebastian Scholz)

The early Middle Ages (c. 500–1000) feature a series of crises. Historical research is concerned with environmental disasters and their impact on early medieval societies in Western Europe. Catastrophes such as floods, droughts, heat, and cold, as well as war, led to supply difficulties and famine (Jankrift 2003; McCormick et al. 2007; Rohr 2008). A major consequence was the impoverishment of that broad class of freemen who had few economic resources. They reacted by selling or abandoning their children and selling themselves into servitude, among other things. However, this led to distortions in the social structure, as taxpayers and fighting men were lost in this way. Until the time of Charlemagne (768–814), early medieval rulers made no consistent attempts to take measures against this development (Scherner 1994; Jörg 2010). The consequences of impoverishment had to be absorbed by the Church, which had a well-developed system of care for the poor. It can be observed, however, that individual bishops took measures not only to alleviate poverty, but to fundamentally counteract the impoverishment of their congregations (Zimmermann 2022). Charlemagne was the first medieval ruler to take consistent measures not only to alleviate the consequences of environmental disasters, but also to prevent large-scale impoverishment. A particularly interesting question is which measures were developed, how they were implemented, how effective they were, and why their impact often remained so limited.

Second, the relationship between law and rulership is an important new field of research in historical studies. In the early Middle Ages, unstable systems of rule and law repeatedly led to political crises that affected society as a whole. Law and rulership concerns itself with politically precarious constellations in medieval Europe, where law and rulership are contested and the situation is characterised by competition between different legal codes, jurisdictions, and forms and practices of rulership. The concept of "legal pluralism" has been used to study the fraught coexistence of (formerly colonial) state law and customary law in (modern) postcolonial societies (Benda-Breckmann 2002), but the plurality of legal systems is also an important characteristic of many medieval societies in Europe (Duve 2017; Scholz 2022). Legal pluralism is further linked to contested rulership – that is, the practice of rulership in which different claims to political authority compete with one another (Liebs 2008). Understanding the historical development of legal pluralism in Western Europe, the impact of unstable rule on the functioning of legal systems, the extent to which the use of different legal spheres can stabilise rule, and the relationship between the normative and practical levels of law can help us better assess comparable modern crisis situations today.

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7. *Psychology: A Psychological Definition of Crisis and Crisis Competence (Alexandra M. Freund & Urte Scholz)*

In psychology, a crisis is often defined as a period of severe difficulty and distress that cannot be resolved using the coping strategies people typically have at their disposal for less severe stressful events (e.g., Caplan, 1964). Central to psychological theories of experiencing and managing stress in general, and a crisis in particular, is the concept of appraisal. In their seminal work on stress, Lazarus and Folkman (1984) emphasise the transactional nature of stress and coping, where stress occurs when the demands of a situation are subjectively appraised as exceeding the available resources. For example, a situational demand could be the death of a loved one, appraised subjectively as harm or loss. The appraisal of one's own resources may result in a feeling of low or no control over the situation, which is a typical experience during a crisis (Caplan 1964). The combination of these two subjective appraisals would thus result in a severe stress experience. An important consequence of the focus on individual appraisals is that stress and a psychological crisis are subjective in nature (e.g., Cohen, Gianaros, and Manuck 2016). Coping with stress and crisis is defined as the ways in which people mitigate the negative effects of stress (Folkman 2011a). The coping literature began by distinguishing between problem-focused strategies (e.g., trying to change the situation) and emotion-focused strategies (e.g., acceptance, positive reframing; Folkman 2011b). More recently, greater nuance has been brought to coping research, encompassing meaning-finding (Folkman 2011b) and interpersonal aspects such as social support (e.g., Knoll, Scholz, and Ditzen 2018). Social support plays a central role in successfully coping with stress, as others can provide both emotional and instrumental support in a stressful situation or crisis (Knoll, Scholz, and Ditzen 2018).With regard to the effectiveness of coping strategies, the original tenet of the transactional stress theory was that it depends on the situation if a given strategy proofs adaptive or not (Lazarus & Folkman, 1984). For example, avoidance could be adaptive if a stressful situation was not under a person’s control, but could be maladaptive, if it was and could be changed. However, there is some evidence in research synthesis that avoidance coping is related to higher distress (e.g., Littleton, Horsley, John, and Nelson 2007).

There are two major hypotheses regarding how well people can manage a crisis in old age – the time in life when most people are retired and begin to face health-related and cognitive decline (typically over 65 years of age). On the one hand, the "resilience perspective" posits that older adults have accumulated life experience and knowledge from previous difficult situations or even crises, providing them with a broad portfolio of potential strategies to draw on when facing a new crisis; this approach also stresses the plasticity in psychological adjustment well into old age (e.g., Staudinger and Greve 2016). On the other hand, the "vulnerability perspective" focuses on the age-related losses and decline in health and various cognitive functions (e.g., Baltes, Lindenberger, and Staudinger 2006), which render older adults more vulnerable to new and highly demanding situations. In fact, in their influential model of ageing and managing stress, Kahana and colleagues listed age as one of the central vulnerabilities when facing difficult situations such as a crisis, because "stressful experiences of the distant or recent past, as well as ongoing stresses, cumulatively result in interpretation of the present as unsatisfying, and of the future as hopeless. These appraisals in turn lead to psychological distress …" (E. Kahana, Redmond, Hill, Kercher, B. Kahana, Johnson, and Young 1995, 461).

Although there is evidence for both perspectives, there is no evidence that older adults are generally less well equipped to manage stress and crises (Staudinger and Greve 2016). Returning to Lazarus and Folkman's general distinction between emotion- and problem-focused coping, a similar distinction has been made in the field of ageing research, referred to as primary and secondary control (e.g., Heckhausen, Wrosch, and Schulz 2010) or assimilative and accommodative coping (e.g., Brandtstädter and Renner 1990). This research shows that with increasing age, people tend to use more secondary control or

assimilative coping strategies that are geared towards the appraisal and interpretation of a situation (such as highlighting the potential positive outcomes of a negative event), and fewer primary control or accommodative coping strategies, such as changing the situation in accordance with one's goals. This line of research suggests that the way individuals cope with stressful situations and crises changes across adulthood, rather than that they are generally more or less resilient or vulnerable.

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8. Informatics: Technical Competencies in Case of a Crisis (Burkhard Stiller)

The use of Information and Communication Technology (ICT) infrastructure has today reached a level of dissemination and penetration across not only businesses and governments, but also societies as a whole, such that dependencies on ICT services (typically provided by certain software systems and packages

running on hardware installations) and ICT infrastructure deployed in the private, public, and partnership-based domains have become crucial.

Not only does the pure operation and durability of any of these system components require careful design, operation, and maintenance, but their hardening against cybersecurity attacks – whether deliberate, well-intentioned, or simply the result of unintended misuse – is equally essential today in preventing system unavailability. Of course, depending on the specific applications and operations required, the measurable set of factors and dimensions needed will vary considerably. The problem today thus lies with the heterogeneity of ICT infrastructure and its services, particularly where demonstrable proof of a certain "level of security" and resilience against failures or crises is concerned.

But even the term “security” itself opens room for debate; technically it covers a range of seven pillars of importance (Authentication, Authorization, Integrity, Privacy, Confidentiality, Non-repudiation, and Anti-replay protection) and is extended even further by at least five elements, including Anonymity, Pseudonymity, electronic Identity Management, Auditing, and Trust as well as Trusted Third Parties (TTP).

Under the assumption that driven by a risk analysis and its outputs a set of well-determined services, Hardware and Software components, and stakeholders are considered to be in a state at risk, the related crisis is not far off, since many different facets of such a heterogeneous, complex, but typically still interoperable approaches may suffer, dimmish, or even fail. This can happen due to internal attacks of users and employees working with such a system daily, or it can happen from the outside, such that external attackers do focus on certain (illegal) benefits to be achieved.

As soon as attacks become visible (if they can be detected at all, which is not always possible in real time), countermeasures and mitigation measures may be available and can be deployed, albeit with very different and purely reactive approaches.

Thus, if the risks at hand are weighted as significant, knowledge of technical system details, mitigation measures, and the roles of all stakeholders involved becomes key to determining which technical vulnerabilities need to be addressed, which organisational measures need to be defined, and which steps must be taken immediately. These three competencies need to be developed and articulated well before any crisis is imminent, as only their existence can potentially help to minimise the impact of a crisis when applied correctly.

In summary, knowledge of systems, their complexity, interaction modes, and operations can help to prevent crises in the event of cybersecurity attacks. Such knowledge can be used to harden systems against new generations of attacks and related crises, as well as to deepen the expertise of developers, operators, and users of ICT systems and services, enabling them to prevent or respond to attacks within a reasonable timeframe.