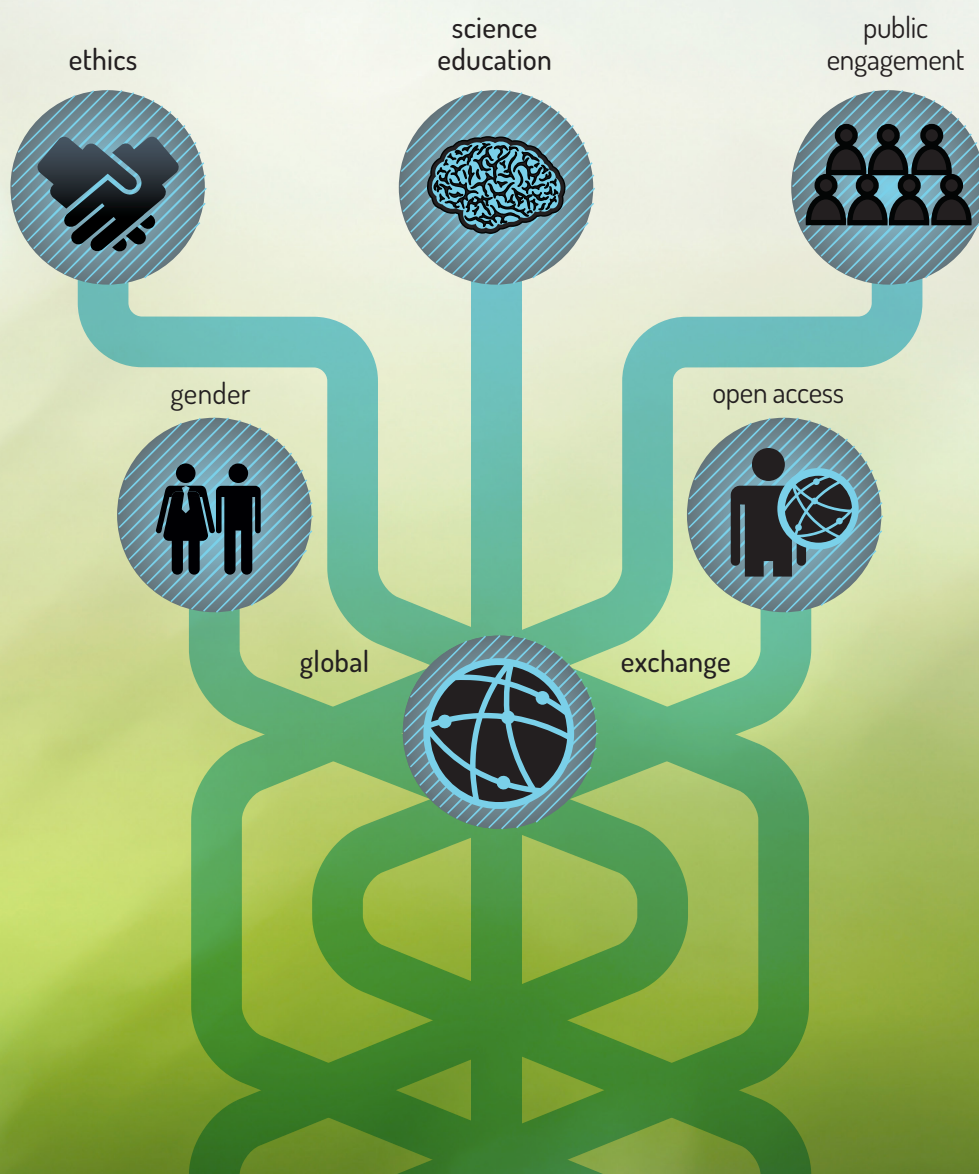


Global RRI Goals and Practices

Synthesis report on the second round of ASU case study in the international mutual learning process

DELIVERABLE D9.2





JERRI – Joining Efforts for Responsible Research and Innovation

Deliverable D9.2

Global RRI Goals and Practices

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PURPOSE

Within the JERRI project, two large European Research Organisations, Fraunhofer (FhG) Germany and TNO Netherlands, have the ambition to further develop their organisational structures and practices towards – what in Europe is called – "Responsible Research and Innovation (RRI)". In this context, the work package called "International mutual learning process" (WP 9) carries out in-depth case studies of two outstanding organisations outside Europe, the Chinese Academy of Sciences (CAS) and Arizona State University (ASU). Two international mutual learning workshops and three reports shall help to share insights from the international cases, to offer interpretations for implications in the European context, to support international mutual learning between the participants of this exercise and to facilitate institutional change at Fraunhofer and TNO.

At first, two rounds of in-depth interviews were planned in both institutions. The key reason for this approach was to achieve a broad empirical base in order to learn how responsible research is spread across the organisations.

The first report of this work in 2017 summarised the first round of case studies interviews and workshops that focussed on goals and practices relating to RRI at CAS and ASU. The aim was to learn from international experiences in order to gain inputs for sharing the RRI goals, as well as RRI action plans of FhG and TNO.

Due to the complexity of the two organisations and the different institutional environment, the second report of the international mutual learning process focusses exclusively on ASU. It became clear that approaching interview partners for the second round at CAS would be hindered by the lack or reservation of networks of our first round interview partners. It turned out to be complicated to connect us with more people in different research institutes at CAS in the second round. Also, staff at CAS tend not to fix appointments and prefer spontaneous and flexible approaches. We realized that the intention of broadening our understanding of the RRI approach and institutionalisation at CAS was almost impossible. As a consequence, we decided to skip the second round interviews and concentrate efforts exclusively on ASU.

In a first, early analysis, the results were presented in a descriptive, exploratory manner in order to allow an open account of the approach to responsible research and innovation at both organisations. In a second step, we now deliver a deeper empirical base for understanding narratives, structures and systemic practices of responsible research and



innovation at ASU. At the same time, the report refers to a deeper and further developed theoretical framework of *Deep Institutionalisation* and applies the four characteristics of *Deep Institutionalisation* to the case of ASU.

In essence, Deliverable D9.2 “Global RRI Goals and Practices” delivers a detailed example of the institutionalisation of RRI within a complex research organisation. The institutionalisation of RRI, which means that RRI becomes an integral part of the practices of an organisation, requires in most cases institutional change, which is why leadership, the culture of an organisation or incentives and rules need to be in the focus. As pointed out in the first report, the term RRI is not in use internationally, so reflecting on the essence of RRI needs to be the basis of each exchange. This report therefore also shows the individual understanding and meaning of “responsibility in science and innovation” and analyses how various facets of RRI are being implemented and institutionalised. The report also discusses problems and challenges within the process of institutionalisation.



EXECUTIVE SUMMARY

Intention and structure of this report

RRI provides a set of concepts, virtues, tools and practices designed to closer align both the orientation and the effects of research and innovation (R&I) processes with societal needs and values. Given such a broad working definition, organisations need to find their own RRI practice and culture. As a consequence, this work package called “International mutual learning process” (WP 9) wants to inspire and illustrate the process of goal setting and institutionalisation of RRI by analysing the transformation process of the Arizona State University (ASU). This outstanding organisation is a prime example for organisational change according to the image of the New American University (NAU). The case study aims at understanding how RRI becomes an integral part of the practices within the organisation, how ASU has changed its organisational culture and how they manage and sustain institutional change in different ways.

This report is structured as follows: After a short summary of the objectives, results and methodology of the second part of the international mutual learning process, the second chapter provides an overview of the underlying theoretical framework of *Deep Institutionalisation* (DI). The subsequent chapter presents the main empirical findings of the second round of the case study at ASU regarding the institutionalisation of de-facto Responsible Research and Innovation (rri).¹ The findings are structured along the four theoretical characteristics of *Deep Institutionalisation* – (1) Evolution of dominant narratives regarding rri; (2) Maturation process regarding rri; (3) Systemic Consolidation of rri and (4) Vertical multi-level alignment of rri. The findings mainly rely on in-depth interviews and documentary research and describe the development and institutionalisation process of a responsible culture at ASU. It also presents an insight into individual perceptions and personal understandings of responsibility in the science sector and its implementation. It also offers insights into factors that drive or hamper institutional change and in particular the institutionalisation of RRI. The last chapter summarises the main findings and draws conclusions on potential implications of this work for JERRI and beyond.

¹ As ‘Responsible Research and Innovation (RR)’ is an exclusively European approach, which is almost non-existent in the US-American debate, we refer to “de-facto rri” when describing equivalent approaches to responsible research at ASU (Randles et al 2013, 2014, 2016).



Methodology

This case study is based on 35 in-depth interviews with all in all 39 researchers and faculties at ASU. These interviews were conducted in two rounds in autumn 2016 and 2017. The report also relies on document analysis and desk research. This broad empirical base shall provide the basis for understanding the institutional transformation at ASU and drawing relevant conclusions for Fraunhofer and TNO.

Interview partners were chosen to provide a large variety of information from different parts of the organisations, academic as well as administrative. The interviews that took place during the on-site visits in Phoenix therefore cover the perspectives of persons at various organisational levels and units in order to ensure a deep and thorough empirical base for conclusions. Project partners from Fraunhofer and Manchester University had previous contacts to ASU who had committed themselves to act as main contact persons for this study and to provide access to documents as well as interview partners. This proved to be very helpful. Practical experience in the first round also showed that the identification of interview partners is only possible using a snowball principle and asking first contacts to provide information about other potential contacts that were then contacted and interviewed during the second field visit in Arizona. It is particularly difficult to identify interview partners who do not (yet) practice RRI and who are interested to reflect about potential barriers (and levers) for RRI in their working environment. As it is easier to observe what is there as compared to what is not (yet) there, we are aware of the fact that our samples of interview partners have a bias towards the faculties and staff who are engaged more actively in responsibility issues.

Results

After a long period of growth and expansion, Arizona State University (ASU) is with over 72,000 enrolled students one of the largest universities in the United States. ASU has also become a major research organisation and a top place for innovation. Since Michael Crow became 16th President of ASU, the university has undergone a radical institutional transformation. Relating to the vision of a “New American University” (NAU), ASU has committed itself to more inclusion and widening participation of higher education as well as to outreach activities, social embeddedness and impact oriented research.

This report gives insights on a vivid rri culture, whereas rri stands for de-facto responsible research and innovation as opposed to Responsible Research and Innovation (RRI) as it is coined and defined by the European Commission in Horizon2020. In practice, there



is no reference to the five key fields of action as in the European Approach. ASU operates based on rationales which increasingly respond to new understandings of responsibility. It has therefore adapted its role within society and its linkages to society. However, there is no reference to the five key fields of action according to the European definition of RRI. In contrast to that, ASU acts according to its eight design aspirations – (1) “Leverage our place”; (2) “Transform society”; (3) “Value Entrepreneurship”; (4) “Conduct use-inspired research”; (5) “Enable student success”; (6) “Fuse intellectual disciplines; (7) “Be socially embedded” and (8) “Engage globally” with a priority on accessibility to a diverse student body.

At ASU, new narratives were developed. Interviewed researchers and staff adhere to an impact-oriented, use-driven and responsive oriented understanding of research and also of university in a broader sense. These new rationales were accompanied by new practices, structures and incentives that show evidence for a matured institutionalisation. This meant in particular a rigorous re-organisation of a large number of academic and research units into inter- and transdisciplinary schools and centers.

As empirical findings show, institutional entrepreneurship and strong leadership were the driving force for institutional change at ASU. Identifying new streams of funding, radical decisions in investing in new research centres and new hiring policies focussing on people with a mindset similar to ASU’s design aspirations were the main instruments for implementing institutional change. However, findings show also a high differentiation of individual orientation and understanding of responsibility. We also find that, still after several years of evolution, shared understanding remains often at the surface. Central terms – like “responsibility”, “impact” or “social embeddedness” – are rather serving as umbrellas for a diverse set of activities throughout the organisation. This is certainly a logical consequence of a high degree of complexity and heterogeneousness of the university. Besides, researchers in particular are confronted with a set of diverging performance requirements within the organisation but also in the entire science community. As a consequence, new aspirations develop and co-exist with existing rationales. These new goals then rather add to the organisational self-conceptualisation than replace it. Nevertheless, the new rri-type narratives are shared by many in the organisation.



DELIVERABLE REPORT

1 Introduction: International mutual learning – why and how?

1.1 Objectives of the international mutual learning process

JERRI's international mutual learning process aims to analyse RRI-related practice in two international organisations, the Chinese Academy of Sciences (CAS) and the Arizona State University (ASU) in order to learn from their experiences as inputs for shaping the RRI goals as well as RRI action plans of the Fraunhofer-Gesellschaft (FhG) and TNO. The analyses have the following focuses:

- 1) Learning from different meanings and facets of RRI
- 2) Measures to institutionalise RRI
- 3) The reasons to/not to implement RRI as well as obstacles and responses/reactions in implementing RRI within the organisation
- 4) Identifying international “good practice” examples

Moreover, an exchange of expertise and experiences with the international partners in the whole project process can facilitate the realisation of mutual learning effects.

The first report provided context information and analysed good practices as well as boundary objects² necessary for institutional change both at CAS and at ASU. The second report aims at providing a deeper empirical base. All in all, 35 interviews were conducted and analysed in order to understand the transformation process at ASU and to grasp the various individual perspectives on rri. Understanding the organisation as such allows to identify key areas of responsible action and the narratives around them, and moreover the important factors that drive or hinder the institutionalisation of organisational innovation.

Responsible Research and Innovation (RRI) is a widely known term – as a political idea and an established funding paradigm in Horizon2020, it has gained some prominence. However, at the level of actors, in particular at the level of organisations performing research and innovation, the term has rarely been taken up, despite the fact that many

² Boundary objects are devices that are designed and implemented to sufficiently connect different cognitive frameworks and enable symbolic sense-making across different communities of practice. They form boundaries between groups through flexibility and shared structure (Star and Griesemer 1989, Star 2010).

organisations have started a large number of activities of RRI relevance in addition to many in place already. Outside Europe, as the findings in the in-depth interviews show, the term is almost non-existent, although again one can find a large array of activities that relate to the label. In this regard Randles et al. speak of “de-facto rri” (Randles et al. 2013, 2014, 2016). As a consequence, in this report, we open up our understanding of RRI and go beyond the conceptual elements of RRI discussed in Europe – based on the following working definition: RRI means to align research and innovation better with societal needs and values. Accordingly, de-facto rri approaches and practices are designed to increase mutual benefits of research and innovation – and society, both by underpinning R&I processes and R&I outcomes.

1.2 Methodology

The described objectives are to be achieved through an in-depth case study of Arizona State University (ASU). This final report relies on empirical data extracted from overall 35 qualitative interviews and documentary analysis.

The interviews were conducted in two rounds during field visits in Arizona, USA, in autumn 2016 and 2017. This report synthesises the overall results on the ASU case study. In contrast to the first case study report, the final report focuses mainly on findings of the qualitative interviews, now that both series of interviews have been completed and analysed.

1.2.1. In-depth interviews during on-site visits

Fraunhofer ISI carried out and comparatively analysed 35 in-depth interviews. To enhance the quality of interview information, the interviews took place face-to-face and on-site at ASU campus. 14 of these interviews were conducted during the first round of interviews in autumn 2016, 21 further interviews during a second field visit in Phoenix, Arizona, in 2017.

The goal of the first interview round was to generate insights on the RRI-related organisational goals and practices of ASU (and CAS). Besides, the interviews aimed at learning about the success factors for the institutionalisation of RRI-related activities, possible obstacles and ways of coping with these barriers, too. During the first on-site visit at ASU, we met 15 people for an interview. Also in this case, it turned out to be a complicated issue to win interview partners, in particular those interview partners who do



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not apply RRI-related thinking or practices in their daily work. To identify this group of persons, some assistance from interview partners during the first on-site visit was needed. We talked to two deans from larger schools, who reported about the diversity of faculty motivations. Moreover, one principal investigator (PI) from the engineering school gave a personal account of his way of living up to the overall mission and a diverse set of incentive schemes. Besides, we talked to seven experts of RRI-type approaches, who belong to the “Center for Nanotechnology in Society” (or the related School for the Future of Innovation in Society) – a center funded by the National Science Foundation (NSF) within the National Nanotechnology Initiative for around 15 years, which has served to bridge technological development with societal expectations and needs. The snowball-method thus helped us in the ASU case to identify at least 20 more names who then turned out to be potential interview partners in round 2, particular those who were able to give more insights into ASU institutes and schools so far not covered. The second round of interviews consequently provided a deeper empirical base for initial findings.

During both rounds, a total of 39 persons from various scientific disciplines and at various organisational levels gave a deep insight into their narratives of rri, their understanding of responsibility, their approaches and implementation into routines and organisational practices. Among them were staff of the administration with responsibilities for strategy, finance, diversity, open access and social embeddedness. Other interview partners were faculty members at different levels of seniority – 12 deans or directors of schools or research centers, 11 professors, 4 preparing for getting tenure and 2 graduate students. Faculty members came from a large number of different ASU schools including leading interdisciplinary schools or centers such as the School for the Future of Innovation in Society, the School of Human Evolution and Social Change, the College of public service and community solutions, the Biodesign Institute, the Global Security Initiative and the Decision Theatre. Interview partners also came from schools and departments which have remained in disciplinary organisational structures such as physics, business, engineering, humanities or arts.

Interviews were recorded and notes were taken. In line with the EU directive on data protection, the contents of the interviews were analysed, aggregated and documented in this report anonymously. The interviews were analysed according to the further developed theoretical framework of *Deep Institutionalisation*. This broad empirical base enabled a better understanding of the different aspects of the institutionalisation process throughout the organisation. It therefore also inspires the development of RRI goals at Fraunhofer and TNO (WPs 2 and 3).

Interview guidelines of the first round

The conceptual work on *Deep Institutionalisation* and the related interview guidelines for European organisations developed in work package 1 served as a blueprint for the interview guidelines used in the international comparison. Section 1 of the guidelines has a narrative nature, as questions start from the context and history of the interview partner. The guidelines comprise five sections:

- Section 1 “The interviewee and his/her organisational context”: aims to acquire background information on the interviewee and her/his organisational context and to analyse her/his statements against this background.
- Section 2 “De-facto rri”: aims to acquire information on the interviewees’ individual understanding of ‘responsible research’ and ‘responsible innovation’, and what they are already doing to enact this understanding.
- Section 3 “RRI”: aims to acquire information on the interviewees’ understanding of the concept Responsible Research and Innovation (RRI) and of the differences/tensions with other understandings of ‘responsibility’ described in section 2.
- Section 4 “RRI practices”: aims to acquire information on existing RRI practices specific to the respective RRI key dimension as defined by the European Commission (Ethics, Gender, Open Access, Societal Engagement or Science Education) plus other important RRI practices as defined by the organisation (e.g. with respect to sustainability, social inequality, etc.).
- Section 5 “Issues for the institutionalisation of RRI”: aims to identify the issues and challenges for RRI institutionalisation within the organisation related to the respective RRI dimension. It can be focused on specific aspects, depending on the RRI practices mentioned in the section “RRI practices”.

1.2.2. Desk research of key RRI-related documents

As mentioned already in the first report on this case study, three kinds of documents related to the international partner organisations were gathered and studied:

- 1) Documents regarding RRI/rri, e. g. strategy/position/discussion papers, mission statements, speeches, etc.
- 2) Documents related to the five RRI key dimensions, which are not necessarily put in an RRI-context already, e. g. action plans, codes of conduct, platforms, portals, regulations, etc.



- 3) Information regarding RRI/rri-related events, e. g. workshops, forums, dialogues, seminars, etc.

The results of this task have provided the project team with a first understanding of RRI/rri practices at ASU. Thus, some possible “good practice” examples were identified.

2 Theoretical Framework of *Deep Institutionalisation*

The theoretical framework of *Deep Institutionalisation* (DI) goes back to Polanyi's reflections on the evolution of market society. His work on the evolution of the market society, called 'The Great Transformation' deals with the long institutionalised economic process that created a range of forms of inter-dependent technologies and regulatory tools alongside the emergence of new professions of labour to facilitate trade and determine property rights (Polanyi 1957). All of these processes taken together produced "[...] entanglements and inter-dependencies that enabled the innovation of market society to become 'deeply institutionalised: eventually to become invisible, taken for granted, unreflexive, reproductive and expansive'" (Randles et al. 2014, p. 31).

Randles et al. extended this understanding of *Deep Institutionalisation* and applied it to analysing forms of *Deep Institutionalisation* of Responsible Research and Innovation (RRI). Randles et al. define four characteristics of *Deep Institutionalisation*:

- the long-term and resilient nature, including tendencies to socio-technical lock-in and irreversibility
- its transformative dynamic – the co-evolution of technological innovations and governance innovations serves to transform agents
- its inter-dependent, systemic nature, comprising integrated and mutually supporting infrastructures of social norms and routines, governance tools as well as economic and ideological logics
- The effectiveness of transformation towards particular normative goals can hardly be evaluated *ex-ante*. One must wait and look back with the hindsight of history, in order to provide *ex-post* evaluation of its 'success'.

Therefore, *Deep Institutionalisation* would be the counterpoint of what neo-institutionalists call shallow institutionalisation or *window dressing*. As Meyer and Rowan point out in their ground-breaking publication "Institutionalized Organisations: Formal Structures as myth and Ceremony", institutionalised structures, techniques, policies and programs function as myths, and many complex organisations like universities adopt them ceremonially, even if they conflict with efficient criteria or with de-facto organisational action (Meyer and Rowan 1977, p. 340). Therefore, organisations build up these formal structures to conform to the institutional environment and to gain legitimacy. They appear as rational to the organisation, especially as universities face great pressures to adapt common models of "good practice" (Musselin 2007, p. 72, Ramirez and Christensen 2013, p. 696). These structures are then hardly connected to



its core activities and mainly serve as a facade created for stakeholders outside the organisation, such as funding bodies, external management boards, students or research partners (Boxenbaum and Jonsson 2008, p. 78).

In contrast to that, deep institutionalisation requires a system of integrated, interconnected and mutually co-aligned governance tools, structures and mechanisms to affect it. It can therefore be defined as the internalisation of normative orientation and a collectively shared value-system, articulated through ‘visions’ but crucially living those visions through demonstrations in practice (Randles et al. 2014, p. 32). Randles et al. therefore developed a framework of four axes to analyse the *Deep Institutionalisation* of responsibility in research and innovation:

1. **Evolution of dominant narratives:** The first step of *Deep Institutionalisation* assumes that new understandings of responsibility do not replace, but rather sediment over earlier ones. Dominant narratives correspond to different dominant institutional logics, thus theorising a small and distinctively different number of ‘ideal types’ with distinctive characteristics and profiles. In reality, these ideal types co-exist and structurally overlap. In essence then, the development of de-facto rri copes with the apparent contradictions implied by the co-existence with different narratives.
2. **Maturation process:** The maturation process can be evaluated according to different graduation levels – ‘**emergence**’, ‘**maturity**’ and ‘**resilience**’. ‘Emergence’ describes the perpetual state of de-facto rri, which is always adapting and evolving in the face of new responsibility framings and problems. It is always “in the Making” (Kuhlman et al. 2016). ‘Maturity’ would refer to a general acceptance of the new proposition of ‘responsibility’ and its embedding into routines, everyday practice, systematised techniques, methodologies, procedures, incentive structures and performance metrics of actors. The final grade – ‘resilience’ – would suggest the newly institutionalised form to be resilient in the face of new challenges. It corresponds to the situation where the institutionalised practices continue and are no longer disturbed by reflexive challenges.
3. **Systemic consolidation:** Systemic consolidation would refer to a situation in which forms of responsibility would be systemically and relationally interdependent moving from ad-hoc localised experiments to extensively shared routinized techniques, norms, standards, governance and regulatory instruments as well as structures, organising practice and inter-organisation exchanges. The



forms of responsibility would be mutually accepted and mutually understood, shared by different professional groups within the organisation. Different heterogeneous actors within the organisation would share a common language of responsibility albeit translated locally into different professional languages, norms, virtues, ethics and action. Randles further describes the systemic “overflowing” character of “deep institutionalised” forms of responsibility as a set of virtues that characterize the eco-system in which an organisation operates, i.e. a mutual understanding, shared norms or governance instruments that characterises partnerships. The existence of boundary spanners which help connect different cognitive frameworks in professional networks is another indicator for systemic “overflowing” (Randles 2017, p. 29).

4. **Vertical multi-level alignment:** This fourth element of *Deep Institutionalisation* considers the coherence of the organisation’s activities with its external environment and with different governance levels. While powerful organisations have the scope to influence and shape the external environment rather than passively accept it as a fixed external determinant, challenges and opportunities are not to be under-estimated. Therefore, an important step to understand the past, present and future of the de-facto rri at the organisation lies in a detailed analysis of the external environment and institutional context in which the organisation is embedded.

The empirical part of this second and final case study report is structured along these four axes of *Deep Institutionalisation*. It first analyses the dominant narratives referring to de-facto rri at ASU. It then examines incentive structures, routines and practices, the systemic consolidation as well as ASU’s coping with different and conflicting institutional logics within its external environment.



3 Arizona State University (case study – Part II)

Arizona State University (ASU) in Phoenix is an example for radical institutional transformation. As described in the first case study report (Deliverable D9.1), ASU started this transformation process in 2002 when Michael Crow became the 16th president of the university. He and a few other institutional entrepreneurs developed a new vision for public higher education in the US called the “New American University” (Crow & Dabars 2015a). Based on the principles of social inclusion, excellence and committed to contributing to public value, this concept served as a blueprint for ASU’s institutional redesign.

The institutional change towards the New American University was accompanied with an **enormous growth process and new funding opportunities**. Over the last 10 years, ASU has emerged as one of the fastest growing research universities in the US. With over US\$100 million in annual research expenditures, ASU has meanwhile surpassed universities like Harvard, Yale, Duke and others. It now ranks among the top 10 universities in the country for total research expenditures and even among the top 5 for interdisciplinary science total research expenditures.³ Counting almost 72,000 students, ASU is today among the largest universities in the US. Following a growth strategy and a clear higher education policy that combines inclusion and excellence, ASU has achieved remarkable results. It has climbed up major higher education rankings for the US and worldwide in the past decade. For example, in the Shanghai ranking of world universities, ASU was ranked 88th in 2014 among the top 100 universities in the world. ASU is 48th among all universities in the US and 26th among US public universities. (ASU 2015a, p. 45). Thanks to new programs and an increase in financial aid, the number of students from families with financial needs has grown enormously as well as the ethnic diversity of the student body and of faculty and staff (ASU 2015a, p. 5ff). Referring to the reputation-based ranking by US News & World Report, ASU is a top place for innovation, ranking number 1 for the fourth consecutive year in 2018 followed by places like Stanford and MIT.⁴ In this context, ASU refers to its cross-disciplinary approach in teaching and research, to its activities, which integrate education, research and innovation, and to its outreach activities in particular with local public, non-profit or corporate partners (ASU 2016a).

³ For further information, see: <https://annualreport.asu.edu/> (last checked on 16.08.2018).

⁴ For more information on the U.S. News & World Report, see: <https://www.usnews.com/best-colleges/rankings/national-universities/innovative> (last checked on 20.08.2018).



ASU defines itself as an entrepreneurial knowledge enterprise. The move towards an enterprise model means to “reject the status of being no more than agencies of the state and to move toward [...] a mind-set that is energetic, responsive and adaptive” (Crow 2010, p. 12). According to Crow, ASU’s “products” are people and ideas. It has the goal to award 25,000 degrees in 2020, which would mean more than a 100 % increase as compared to 2002 (ASU 2014, p. 19; ASU 2015b). Research activity as a proxy for ideas has increased exponentially since 2002 with research expenditures more than tripling from US\$123 million to US\$426 million in 2014 (ASU 2015a, p. 11). As a strategic goal, research expenditures shall reach more than US\$700 million in 2020 (ASU 2015b).

3.1 Evolution of dominant narratives regarding rri

Since 2002, when ASU president Crow came into office, ASU has reinvented itself, following a conceptual model that was later named the “**New American University**”. The New American University breaks in particular with elitist higher education image and with research that only strives for academic impact. Instead, it follows a view on higher education embedded into human life courses and into society. Assuming that the chance to learn and to earn an academic degree can also make a difference to the local community and that academically produced knowledge can make a difference to society, the proponents of the New American University argue that state-owned universities must adopt new rationales and ways of working, which put these embedded views on teaching and research at the centre (Crow and Dabars 2015a, 2015b). Consequently, these new aspirations were included in the new ASU Charter in 2014:

"ASU is a comprehensive public research university, measured not by whom we exclude, but rather by whom we include and how they succeed; advancing research and discovery of public value; and assuming fundamental responsibility for the economic, social, cultural and overall health of the communities it serves."

Table 1: ASU’s design principles and the appraisal of RRI keys

ASU’s design aspirations	Linkages to RRI keys
<p>Leverage Our Place ASU embraces its cultural, socioeconomic and physical setting.</p>	Sustainability and social inclusion (in the metropolitan region of Phoenix, the state of Arizona and the Southwest)
<p>Transform Society ASU catalyses social change by being connected to social needs.</p>	Responsibility for societal well-being by way of science education: Main themes are educating teachers for the region and advancing learning and teaching methods.
<p>Value Entrepreneurship ASU uses its knowledge and encourages innovation.</p>	Innovation for social development and economic competitiveness. Establishing a culture of entrepreneurship among faculty staff and students (including science education and engagement activities and innovation support structures).
<p>Conduct Use-Inspired Research ASU research has purpose and impact.</p>	Balance basic research with research focusing on actual and immediate problems – this includes many engagement activities with the communities ASU serves.
<p>Enable Student Success ASU is committed to the success of each unique student.</p>	Science Education: Main activities focus on a seamless transfer of students from community colleges to university (i.e. engagement with community colleges) and on freshman persistence.
<p>Fuse Intellectual Disciplines ASU creates knowledge by transcending academic disciplines.</p>	Reorganisation of academic units with the aim to design the new entities around questions of societal relevance, e.g. the School of Human Evolution and Social Change, the School for the Future of Innovation in Society (→ Science Education)
<p>Be Socially Embedded ASU connects with communities through mutually beneficial partnerships.</p>	Many different forms of engagement and amplifying impact for society
<p>Engage Globally ASU engages with people and issues locally, nationally and internationally.</p>	Transcultural teaching and collaboration with academy, business and industry, society and governments worldwide (Engagement and Science Education, see also portal for massive online education "ASU Online").

Overall, eight institutional objectives, so-called “design aspirations”, guide the university’s ongoing evolution. ASU’s goals follow partly classical higher education

orientations such as top placements in academic rankings, but to a larger part, they reflect the novelty of ASU's approach, e.g. regarding the diversity of the student body, the interdisciplinary character of research and the social value of ASU. Table 2 summarises the eight institutional goals of ASU. The existing dominant narratives identified in the explorative interviews show close relation to the eight aspirations. For almost every single ASU design, aspiration supporting statements and references were found in the interviews with ASU faculty members. A further existing narrative also connected to the character of the "New American University" is the **notion for accessibility and inclusion**. ASU President Michael Crow defines it in the following way:

"Accessibility is by no means the sole dimension to the New American University model, nor the exclusive focus of our book. But as much as access to knowledge underpins every societal objective in a pluralistic democracy, accessibility is at the core of the reconceptualisation of Arizona State University (ASU), which represents the foundational prototype for the New American University." (Crow and Dabars 2015b, p. 60)

The **strategic goal of inclusiveness is also motivated by the responsibility towards the local communities** to which ASU feels committed to serve. This motive becomes clear from a statement made by an interviewed Physics Professor:

"[We see these students] as an untapped resource and further, a necessary thing for this university to see the broader environment in that forum."

The **understanding of inclusiveness however goes beyond the local community**. ASU generally tries to reach out to people located in regions without any access to higher education, also worldwide. ASU therefore set up a broad online course program. An interviewed ASU Dean defines his understanding of inclusiveness at ASU:

"Being inclusive does not just mean being inclusive on the people we bring to this campus. Being inclusive is going out and finding people in rural Arizona that cannot come to this campus. Finding people in, you know, poor Africa that cannot come to this campus."

Being an utmost inclusive university also means that **students** not only with various social backgrounds but also **with divergent qualifications and educational backgrounds come together**. An interviewed Associate Professor in Engineering describes how ASU faces this practical challenge:

“So we have students who I am thinking ‘wow, how did you not learn this in elementary school?’ to students where it is like ‘this person is fantastic and is going a long way’. And what ASU does is unique. It tries to squish all of these together and move them along before sending them out the door.”

The **understanding of ‘responsibility’ and ‘responsible research’** is closely **connected to seeking societal impact**. Various interviewees relate their definition of responsibility in research to impact and the goal of tackling challenges and problems within society. As the following statements of several interview partners show, university research ought to be use-driven and impact-oriented:

*“We ought to be **innovating**, you know, **according to need**, to use. **We should be really inspired by use** rather than build neat stuff and then find ways to use it [...]. We should be starting and **building neat things to solve the actual problems.**”*
(Professor at the School for the Future of Innovation in Society)

*“**Universities have** the history and in my opinion even more so **the potential to be actual agents of change in society**; coming up with ideas but also prototyping them and implementing them to deal with some of the trickiest problems [...]. **Our purpose is to solve public problems.** So we look around and we see homelessness or we see crime or we see behavioural health problems, or we see inequity in different communities and we say: what can we do to address that? And how can we do it in a way that also addresses our educational mission and our research mission? [...] **We advance the public good by using the basic capacity of the university in creative ways.**”* (ASU Dean)

*“We do not usually do things just because it is interesting. **We do research because there’s a problem out there, so it is kind of fundamentally focusing on impact.**”*
(Director of ASU’s Global Security Initiative)

*“We have to **think ‘responsibility’ in the long term**, so thinking about how to innovate responsibly, **not just throwing new technologies at problems because we have new technologies**, without any discussion of what the impact of that may be on society, on the person, on the person’s family, a year, five years, ten years down the road.”* (Professor at the School for the Future of Innovation in Society)

*“I think as public institutions **we really do have an obligation to impact our place that is in the community we should make a difference.**”* (Professor at the School for the Future of Innovation in Society)



*“What can we do to ensure that we **get the societal benefits out of the technology and avoid some of the negative impacts?**” (Professor at the School for the Future of Innovation in Society)*

*“Doing responsible research as a public institution is to **demonstrate to the public the value of that research and its impact.** So, for us, that means really seeking ways where do faculty have **opportunities to translate their work [...]. We think about responsibility for our community, force of livelihood. Not just the number of start-up companies and patents but really the quality of life by producing great graduates [...].**” (ASU Dean)*

*“Even though we do basic research, **we are always looking for ways that the research can be developed into products that can help society.**” (Senior researcher at a natural science research centre)*

*“The right phrase would be responsive, **being responsive to people rather than being responsible.**” (Professor at the Department of Physics)*

These statements show how numerous researchers and administration staff in fact embrace ASU’s core mission of use-driven research, outreach and social embeddedness. **Research** is perceived as a **tool for societal change**, a mean to tackle local, societal and global challenges. These replies also epitomize an understanding of a modern university as an organisation that not only delivers applicable knowledge but proactively shapes societal transformation.

Another dominant narrative that is part of ASU design aspiration and that was extracted from the in-depth interviews was the entrepreneurial mind-set. In order to be successful, the notion of social responsibility, social embeddedness and outreach has to be connected to **entrepreneurial thinking and a corporate attitude**. An interviewed member of the ASU management explains this attitude as follows:

“We want the mind-set like a corporate. Taking responsibility for own evolution, for our own future, but yet be completely grounded in the public mission. So then, that term is an enterprise. An enterprise takes responsibility for its future [...]. Our enterprise is about knowledge. It is about ideas that people generate in the university. It is about the people that we generate who have those ideas [...], or the kinds of things that we build in the university that causes impact.”



Various interview partners referred directly or implicitly to this entrepreneurial mind-set. Entrepreneurialism in this context does not exclusively mean commercialising research results and spinning out companies. It rather means innovative and creative thinking, solving problems, seeking success and embracing a market logic. According to that, research outputs need to address a demand, both in economy and in society. ASU tries to combine serving the public and achieving economic success. The interplay of responsibility and entrepreneurial mind-set is not seen as a contradiction. In fact, both aspects are two sides of the same coin. By integrating this mind-set into its design aspirations, ASU can be described as an ‘Entrepreneurial University’. According to higher education literature, this concept relates to an organisation that has a strengthened leadership and steering core, a creative and innovating culture and a diversified funding base (Clark 1998, p. 5ff). Besides, an Entrepreneurial University actively engages within the process of economic development in the local community (Tornatzky et al. 2002). It links the university with local industry and establishes robust mechanisms for knowledge transfer (Bramwell and Wolfe 2008, p. 1177). The strategic goals of ASU for the period of 2015–2020 comply with this strategic alignment. According to that, ASU tries to demonstrate leadership in academic excellence and accessibility and to enhance the social impact and social embeddedness (see ASU 2015b). The importance of leadership, engaged communication and a change in attitudes are undoubtedly important aspects of this transformation process. At the same time, the acquisition of new sources of funding is related in particular to shrinking public budgets. In particular, following the financial crisis in 2008, universities faced a severe decline in state investments in the higher education system. Consequently, ASU started to figure out how to develop new income streams and to be able to pay for the types of initiatives that it wants to offer. In fact, in order to get funding and to conduct use-driven research projects with an outreach orientation, **ASU is dependent on new sources of funding**. Conventional research funding streams would not be sufficient to cover the numerous new activities. Therefore, ASU actively addresses donations and foundations as a Professor of the Global Institute of Sustainability describes:

“So we work closely with private philanthropy. Or foundations, like the Gates Foundation, Dalek Foundation, or the Forbes Foundation, or the Carnegie Foundation and the Mellon Foundation. Whatever the foundation might be, the foundation has an objective, a goal, a purpose.”

In practice however, **finding new funding streams can turn out to be difficult** for the faculties because **some of the new donors do not have experiences in working with**



higher education institutes as they usually focus on social services or charity only. These funding bodies are not part of the conventional research system and therefore hesitate to fund research organisation. Therefore, convincing these new actors can be difficult as an interviewed ASU Dean reports:

“We have a project that would provide better services to children [...]. And the entity that we are applying to for funding has never funded a university before because they fund social service agencies. And they look at us and they say: We are not interested in giving money to a university. And we reply: Well, I understand that but we are not like any other university and we are not asking you to pay for scholarships or whatever, we are asking you to pay for direct services to this client. But they are sceptical of that. So I think that is an issue.”

For additional funding streams, **ASU strategically decided to start or expand summer programming and a massive online education program** (ASU 2015a, p. 24ff). Including students enrolled in online education programs, ASU is now the biggest university in the USA referring to the student numbers.⁵ According to the US News & World Report of 2018, ASU ranks 4th among online undergraduate degree programs in the USA.⁶ The online **study programs at ASU also facilitate further education in the sense of lifelong learning** as they offer opportunities for professionals or people with family commitments who cannot go back to university to take classes and advanced training with high flexibility. The expansion of online study programs was seen as a **chance to increase the impact and leverage of ASU’s aspiration** on the one hand and to establish new sources of income on the other hand, according to a Professor at the School of Human Evolution and Social Change:

“We asked: What other parts of this teaching can we scale in ways that would be successful for students and then we did that? And we did a lot of collaborative work with faculty to develop online platforms that bring expertise together and then can be taught to a lot of students at once [...]. As a result, we are able to suit more students, bring in more money and ultimately have more resources and more time for research. So everybody wins.”

⁵ For more information about ASU’s online programs, see: <https://asuonline.asu.edu/> (last checked: 12.08.2018).

⁶ For further information about the ranking, see: <https://www.usnews.com/education/online-education> (last checked on 13.08.2018).



Since 2013, the number of international student enrolment has more than doubled, with students enrolling from more than 135 countries. According to the Open Doors Report on International Education Exchange by the Institute of International Education, ASU is ranked as the top public research university chosen by international students.⁷

Besides increasing the size of undergraduate population and implementing online study programs, ASU also increased tuition as the tuition rate at ASU used to be low in comparison to other public universities in the country. The consequence was an exponential increase in revenues. These additional incomes has then created the opportunity for many strategic investments in certain initiatives like the Biodesign Institute, the Global Institute of Sustainability or the Global Security Initiative that all address important problems of the state of Arizona.

In addition, the **notion of inclusion is also related to this entrepreneurial thinking**. In order to offer access to higher education for students with difficult social backgrounds, other students have to pay more. Major resources on campus are being spent towards subsidizing people from various backgrounds. It is an intentional adjustment of the overall ASU budget. At the same time, ASU has become popular in particular among wealthier international students, who want to pursue an international degree, as a Professor from the Global Institute of Sustainability reports:

“So we have done a good job of positioning ASU as a famous school that offers an international degree to rich students in the Middle East who want to study engineering [...], who cannot get into more exclusive schools. We provide an opportunity for them to get an education. I am just saying that the way that they pay for that education, they are in our class and paying for it in a way that makes it cheaper for other students. We have a transfer of wealth in this new model.”

Several interviewees describe ASU as an organisation with an **entrepreneurial character**. They refer to a corporate mind-set and an organisation that can change fast and that embraces creativity: “ASU – I guess it is more business-like than other universities.” (Professor at the ASU School of Human Evolution and Social Change)

⁷ For further information about the ranking on international student mobility, see: <https://www.iie.org/Why-IIE/Announcements/2015-11-16-Open-Doors-Data> (last checked on 13.08.2018).



A Professor from the Global Institute of Sustainability further explains this entrepreneurial mind-set:

“There is a vision, there is a style, and that ASU really embraces change and as an organisation it is very entrepreneurial. Which means that it is not sort of a slow moving reflective project driven by moral philosophers. It is a fast moving, growth-oriented organisation, driven by organisational scholars.”

Technology transfer also is an integral part of the “Entrepreneurial University”. Some interviewees report that **ASU encourages various ways of knowledge commercialization** and refer to support structures, in particular AzTE (Arizona Technology Enterprise), founded in 2003, and Skysong Innovations. An interviewed Dean reports that knowledge and technology transfer is perceived as a normal task and activity of the university:

“For us, that means really seeking ways where do faculty have opportunities to translate their work. It might be through licencing their technology. It might be through starting up a company.”

Nevertheless, the Entrepreneurial University also requires a **transfer-oriented mind-set** that embraces the willingness to commercialize knowledge and to adhere to market logic as a Director of an interdisciplinary research centre describes:

“So, it therefore seems that any sort of futuristic planning about biotechnology needs to ask the fundamental question: ‘Is anyone going to use this invention or discovery, and, if so, what is the likely market impact going to be?’ Otherwise, it is very abstract [...]. The only thing that matters is something that can be propagated through markets.”

3.2 Maturation process regarding rri

According to the concept of *Deep Institutionalisation*, RRI has to be incorporated and turned into an integral part of the practices of an organisation. Hence, everyday practices are central indicators for the maturation of institutionalisation. Normally, they are strongly linked to organisational change or changes in the incentives structures.

During the last years, ASU has undertaken **remarkable organisational change**. Many academic and research units are now operating in a inter- and transdisciplinary way and are oriented towards societal challenges as Crow and Dabars point out:



“In the course of a decade, ASU reconstituted its curriculum, organisation, and operations through a deliberate design process undertaken to build an institution committed to the pursuit of discovery and knowledge production, broad socioeconomic inclusiveness, and maximization of societal impact. The academic community has been consciously engaged in an effort to accelerate a process of institutional evolution that might otherwise have proceeded, at best, only incrementally, or possibly in the face of crisis.” (Crow and Dabars 2015b, p. 60).

Overall, ASU has 17 colleges and schools, among them the college for arts and sciences, the schools for business, design and the arts, engineering and a number of professional schools for journalism, law or the college for nursing and health innovation and a teachers’ college. As the university does not have an own medical school, ASU has established a close cooperation with the Mayo Clinic. In the course of the transformation process since 2002, ASU has reorganized a large part of its academic organisation, leaving traditional disciplinary structures behind. A number of new schools have been established such as the school for sustainability, the school of human evolution and social change, the school of aging and lifespan development, the college of interdisciplinary arts and sciences, the college of health solutions and a large number of further schools for example in the business department, the engineering department or the design and arts department (ASU 2015a, p. 53ff).

In fact, the **focus on interdisciplinary research** is a **key** for ASU to **approach societal problems** as a Professor from the Global Institute of Sustainability reports:

“All this cross-disciplinary work is an effort to organise knowledge around the problem we are interested in rather than around the discipline, and ASU is an easier place to do that than a lot of other places are.”

One example for interdisciplinary and use-driven research is the Graduate College at ASU. The **interdisciplinary Graduate College** provides programs that allow students to come together from different academic units to speak to their own research. In the first year course, students are put into groups where they are working with other students from different majors to solve a problem that they have to identify. Its structure is independent of academic units, which enables a disciplinary perspective, as the interviewed Associate Dean at ASU Graduate College points out:

“The Graduate College can have a perspective on interdisciplinary programs that an individual unit at a disciplinary department usually does not have.”



ASU Graduate School has also implemented incentive structures to support interdisciplinary and use-driven research. One of these incentives is the set-up of the **Knowledge Mobilization Impact Awards**. The awards are an annual showcase and research competition with the aim to highlight graduate and postdoctoral knowledge impact projects at ASU. The awards are meant to recognize achievements in transforming formal research into useful policy and practice that will improve outcomes in organisations and public sectors.⁸

In general, the **university structure at ASU does not follow classical hierarchical principles**, but rather **a network structure to support nimble and responsive research activities**. The most important feature of this organisational structure is that horizontal activities are not centrally governed, but rather facilitated or supported by the university administration. Horizontal activities in this context especially refer to all activities which contribute to realizing ASU's mission along the eight so-called design aspirations. As one interview partner puts it:

“We operate kind of like a federation of colleges, each governed by these design principles but free to adopt their own character, approaches, priorities, and free to leverage their assets/strengths differently. So, all colleges/schools are conducting use-inspired research, valuing entrepreneurship, are socially embedded and engaging globally. Very few rules about how to work with one another, freedom to combine and re-combine across disciplines in rapid response to opportunities or urgent community needs. As a result, you see very different models and approaches [for example] to community engagement.”

For the university to accomplish its mission, this means at the level of individual faculty (and staff) members that expectations of performance have significantly grown over the past years. **New evaluation and performance indicators were developed and added**. At the same time, traditional evaluation standards however have not been replaced.

⁸ Each year, three Awards are bestowed. In 2017, funds were bestowed as follows – US\$250 for research projects at Masters Level, US\$500 at the doctoral level and US\$800 at the postdoctoral level. For more information about the Knowledge Mobilization Impact Awards, see: <https://graduate.asu.edu/professional-development/knowledge-mobilization/impact-awards> (last checked on 15.08.2018).



For example, there are now Sustainability Criteria:

“ASU is the first university to integrate sustainability criteria into its staff evaluation program. All employees are evaluated on their contribution to our sustainability efforts.” (ASU 2011, p. 42)

Another criteria that has been developed to measure impact of research is **media coverage**, as an Assistant Professor in Engineering reports:

“It [ASU] does keep track of publications and probably quantity of publications but also, is your work recognised in the media? [...] It is more like the media is one indicator that recognises something that is relevant [...]. Because, if the local news is coming in and reporting and sharing the story abroad, apparently that content is of interest, at least they perceive to, to a broader audience.”

ASU also builds up structures to promote knowledge and technology transfer activities. **Arizona Technology Enterprises (AzTE) is the exclusive technology transfer organisation** within ASU. It works closely with faculties, investors and industry partners in order to translate research results into broad societal impact. Since its start in 2003, AzTE has launched over 120 start-ups, which have generated more than US\$700 million in investment capital. AzTE has also received more than 2700 invention disclosures. All in all, 595 patents have been issued since 2003. According to the Milken Institute report “Concept for Commercialization: The Best Universities for Technology Transfer” from 2017, ASU has surged in technology transfer rankings. The report focuses on four key indicators of technology transfer – patents issued, licenses issues, licensing income and start-ups formed. Compared to the report in 2006, it has improved from rank 43 to rank 21 in the most recent report (DeVol et al. 2017).

The **radical process of de-institutionalisation and re-orientation** to new missions was **accompanied by a major shift in faculties**. ASU has hired lots of new research and administration staff that embrace the values of the New American University. At the same time, ASU has experienced a **loss of up to 1800 faculty members over the last years**. An interviewed Professor from the Global Institute of Sustainability therefore hopes for a **change of focus from hiring new people to retaining the existing staff**:

“ASU has done a good job of hiring [...]. We have attracted people who are attracted to the mission and attracted to the ideals of the new American University. But we have not shifted from a focus on attracting new faculty to keeping developing the faculty. That shift has started but it has not been completed [...]. We are more attracted to



people who are outside our own university [...]. We scour the world to try to find the best people. We would keep investing in the best people when they are here, to accentuate their strengths. But I think there is still a conservative attitude in many universities, and it exists at ASU, too.”

The following overview summarises the promoting and hindering factors for the institutional maturation process of de-facto RRI at ASU:

Success factors

- The new university structure facilitates networks and supports responsible research activities.
- The normative re-orientation has been driven by a high commitment of the university leadership and has been legitimized by a new business model that flooded millions of additional research dollars into ASU’s pocket as well as by a clear (number-driven) communication showing the benefits of the approach.
- ASU built up a professional structure and the know-how in knowledge and technology commercialization processes.
- maturation of institutional transformation through inter- and transdisciplinary Graduate Programs
- Strategic decisions lead to massive investments in new structures and new interdisciplinary research centres/units.
- Maturation processes are taking place, in particular the organisational redesign, new incentives, a consistent communication, to support high degrees of shared understanding and cultural change (e.g. entrepreneurial spirit).

Hindering factors and challenges

- Goal and incentive structures have not totally been replaced, rather expanded, so there are classical higher education goals and New American University goals simultaneously in place – partly producing high pressure on individual faculty members.
- Shared understanding remains often at the surface, with central terms rather serving as umbrellas for a diverse set of activities. ASU has acknowledged this as a weakness in the context of its sustainability efforts.
- The radical de-institutionalisation and re-orientation was accompanied by a massive shift of faculty staff. About 1800 faculty members have left ASU throughout the years – a partly very painful process (Randles 2015).

3.3 Systemic Consolidation of rri

Systemic Consolidation refers to relationally inter-dependent forms of responsibility and mutually accepted understandings of responsibility. It implies moving from ad-hoc localised experiments to extensively shared routinized techniques, standards, norms and governance, regulatory instruments and inter-organisational exchanges.

According to organisational theory, a profound and mutually accepted institutional change can be achieved when organisational actors with adequate resources and power pursue their own interests (DiMaggio 1988, p. 18). These so-called **institutional entrepreneurs** have an interest in particular institutional settings and are able to initiate institutional transformation or even to implement new institutions. They break out of existing and predominant paths, they use their resources and develop strategies to act proactively and according to their own interests (Maguire et al. 2004, p. 658; Garud et al. 2007, p. 957; Battalina et al. 2009, p. 65ff). Institutional entrepreneurs are therefore needed in order to push forward institutional change and to accomplish systemic consolidation across large and complex organisations. Within this case study, interviews and documentary research provide information on the existence of such institutional entrepreneurs within ASU. Especially the particular **role of the 16th ASU President Michael M. Crow was highlighted in various interviews** with ASU faculty members. According to that, he was the **main initiator for that change**. His strategy for ASU was cited by one interviewee as follows:

“We [ASU] are going to do things in a different way, we’re going to make very large investments, they are not going to be egalitarian, we’re going to look at things very strategically and say strategically where can we advance rapidly, and that’s what we’re going to do.”

Institutional Entrepreneurs also manage to navigate through resistance and heavy opposition within the organisation as an interviewed Professor at the Herberger Institute for Design and the Arts states:

“So the charter is deeply embedded in the culture, and somehow academics like to resist it all, and so universities usually do not change that much. This president just got through that resistance and people did not win. He won. He basically won against the sculptures [...]. He was so dynamic, he was so successful, he was so good at getting resources.”

The institutional change that was initiated by **President Crow** has been perceived by many interviewees as **a new era**. Various interviewees, for example, referred to the time before Michael M. Crow took over ASU presidency as “Period BC – Period ‘Before Crow’”. Another interviewee described President Crow as follows:

“Michael Crow has been the explosive detonator that has set ASU on an amazing trajectory [...] it has always been an upward trajectory [...].”

One instrument for institutional entrepreneurs to achieve systemic consolidation and a sustainably translation into daily practice that was identified in the interviews is **hiring and staffing procedures**. Several interview partners admitted that it turns out to be difficult to impose a new frame of values and to force well-established researchers to change their motives, attitudes and values. Instead, a sustainable systemic change can be achieved through **hiring people that already embrace the manifested vision of ASU**, especially referring to its focus on inter- and transdisciplinary research with impact orientation. This notion is described by an interviewed Dean in humanities:

“In the humanities, it is very difficult to get people to change their ways, and cramming them into a new unit is not going to make an individual researcher change what she thinks about her research. What we need is to make great hires of people who think across disciplines [...]. [ASU] has hired these really, really smart people who think more broadly about what they do and who are willing to think beyond the box.”

And a Professor at the ASU School of Human Evolution and Social Change adds:

“[...] I think the faculty did a really good job in assessing whether someone would be able to intellectually connect in some way to the core. So the core was a value and then adding the people around has also been of value to maintaining that culture of respect.”

Also the Director of a natural science research institute mentions **hiring of new young and inspired researchers as a key to institutional change**:

“I will just say it. I think, as with any transformation, partly it happens as older faculty leave and newer faculty come in. As an administrator, I have been involved in hiring newer faculty, and they fit into this idea of the New American University really well and really easily. It is sort of second nature to them. [...] They just assume that the work they do is going to have some impact on society and many of us older faculty have a bit more difficult of a time adjusting to these ideas [...]. It is not just bringing



new faculty in. Part of the selection process is finding people who think this way. I think that will allow the transformation to happen more easily and I say that as one of the older faculty [...].”

The **ASU charter also helped to attract people with a certain mindset**. This hiring policy then automatically leads to a new culture throughout the organisation, as the new faculty starts to shape the university with its values. A professor from the ASU Herberger Institute for Design and the Arts confirms this cultural change through hiring new faculty:

“Then people came who were excited about the idea of being in a space where they were going to be challenged to think differently. They were going to be challenged to explore alternative ways to learn and embrace technology.”

Once the maturation process gained enough strength, an **organisation also achieves more attractiveness for people with a certain mind-set**. Fluctuation changes the culture of an organisation when researchers, chairs and administration share common values as an interviewed member of the ASU management affirms:

“We do not have to intervene much at all because faculty are naturally inclined to appreciate, acknowledge and reward and recognise people who work across disciplines. It has become more a part of the culture of the university [...]. Of course, new people come in because they look at these values and they are attracted to the values. Then you do one more thing. You invest in promoting those values. If you are able to invest, then the culture shift can happen with new people and with the people that are already in the system. It is about matching the right person to the right culture and the right values and the right environment [...]. There were more fluctuations, there was change in leadership. Leadership which believed in this set of core values. And when deans and chairs believe in that, and the administration believes in that, then that slowly starts to seep down into the culture of the institution.”

In order to **sustain an achieved cultural change, ASU also implemented a Leadership Academy** in 2012 to cultivate a new type of leadership and management personnel within ASU faculty staff. The Leadership Academy embraces the social embeddedness of the organisation, innovative collaboration and adheres to the values of a New American University. The program provides a year-long series of trainings to ASU faculty members who emerge as leaders to increase the university’s capacities to further fulfill its ideals. The main focus of the Academy is on team building,



communication, creating and securing resources, connecting with internal and external communities of experts and building a culture of excellence.⁹

ASU has also **implemented instruments to monitor and secure its outreach activities**. Unlike other institutions, ASU does not have a central office of community engagement for example. While most universities centralise all the efforts that are connected to social engagement, it is a fundamental part of the charter at ASU. As a consequence, every college and unit is responsible for this mandate, for embracing and interpreting social embeddedness. In order to still keep track of these activities, **ASU has set up an annual Social Embeddedness Survey to inventory the diverse community-engaged activities** and projects across the organisation (ASU 2016b). The results of this annual survey are used to monitor the growth in ASU's partnerships, to detect areas of synergy and potential collaboration within the university and to evaluate the extent to which the university makes good on its promise to effect positive change in the surrounding communities. It is also used to identify spots of noteworthy activity that should be showcased in collected materials and fundraising campaigns. ASU's website also informs about the last survey results.¹⁰ This is not without effect. The annual survey often requires faculty members to think about their activities from a different point of view and reflect about what engagement is and how they perform engagement activities. More importantly, they get an idea that relationships can be established between their activities and others at ASU. Often, they hear about similar activities in other parts of ASU for the first time and can start a fruitful exchange. By asking questions and bringing in new points of view, the role of central administration staff can be called a "Chief Disruptive Officer".

Many functions in the university administration have been redefined, being practically now boundary spanners as well. Moreover, **ASU has decentralised this task to its faculty members**, now requiring them not only to teach and research, but to link their operations with ASU's mission and contribute to its societal impact. As a consequence, strong leadership through institutional entrepreneurs combined with a decentralisation strategy and a hiring policy that focuses on use-inspired research, outreach and interdisciplinary thinking leads to systemic consolidation. **The vision**, on the one hand, **is**

⁹ For further information about the ASU Leadership Academy, see: <https://leadershipacademy.asu.edu/about> (last checked on 12.08.2018).

¹⁰ For further information about the results of the ASU Social Embeddedness Survey, see: <https://community.asu.edu/survey-results> (last checked on 12.08.2018).



implemented top-down. The **systemic consolidation**, however, **grows bottom-up.** This is being reflected by a professor at the School for the Future of Innovation in Society:

“We do not have a very top-down, strong, legislative, bureaucratic structure like Europeans do [...]. But yet we have a lot action and creativity. It’s like bottom-up, find out how you can transform yourself in a way that works towards this aspiration but does not cost you more [...]. So it is more of a bottom-up approach, more unique and involving self-discovery by the bodies that are contributing but keeping their eyes on the actual choices and activities of research and innovation.”

Besides, the focus on **inter- and transdisciplinary research is consolidated at ASU through architecture.** Various schools and buildings are built and structured in a way to facilitate exchange between disciplines. A particular example for that are the Interdisciplinary Science and Technology buildings as an associate dean at ASU’s Graduate College explains:

“In my building, there are people from chemistry, there are people from physics, there are people from bioengineering and there are people from life sciences, and that is the whole point of the building. The labs are big, they are open, there are six faculties in the big lab where I have my lab and it is very open.”

Boundary objects like interdisciplinary labs and studios have been created throughout the university to foster interdisciplinary thinking. A professor at the Global Institute of Sustainability describes this ambition:

“I bring all these students together, and they are all co-located in what we call the studio. It is not a lab but there is a lot of opportunity for informal knowledge sharing among them. And so now we have English and communication and design and engineering, certainly, and sustainability. And all of these students are in sufficient proximity or working on similar or related if not the same projects. We can create a peer-to-peer mentoring network. That is extremely ambitious in its reach throughout the university.”

At the same time, many **academic units and schools have embedded inter- and transdisciplinary research into the curriculum of teaching programs.** Various interviewees argued that it was much easier to implement and grow certain visions and missions among students, like for example outreach and use-inspired research with an interdisciplinary focus. Fostering values and implement those values in study



programmes creates a new culture much faster than forcing established researchers to change their focus:

“This is some kind of thinking, which one needs to just grow among faculty and amongst students as well. Like anything else that grows, you have to water it and put it in fertiliser. A lot of it happened at the student level. I think students are a good venue for doing interdisciplinary research. You start getting them to think that way and then they pull you in and they’re also a good venue for interacting because they’re open to these questions. [...]. It’s not threatening to them because they have got nothing at stake. They have not spent 10 years developing X, Y or Z, so if somebody were to decide that X, Y and Z isn’t as it currently exists entirely ethical, then that’s not so much of a problem for students. Whereas, it’s a bit more difficult for a faculty member.”

In general, ASU has managed to realize this overflow in the past 10–15 years also by **strategically building partnerships, for example with corporate and community partners, donors, NGOs or other universities**. Partnerships that generate mutual benefit are a central goal, for example in all its social embeddedness activities. Many “professional” **boundary spanners have been put in place** such as the Skysong incubator and other service units facilitating entrepreneurship and innovation.

3.4 Vertical multi-level alignment of rri

According to neo-institutionalist theory, complex organisations like universities are considered as “open systems” that are in exchange with their environment and are influenced by external requirements and institutional settings (Weick 1982). Accordingly, vertical multi-level alignment refers to the relationship of an organisation to its external institutional environment. As a consequence, the in-depth interviews also inquired conditions within the external environment at ASU that either support or hinder the rri approach of the organisation.

Supporting factors for institutional change within the external environment

One development in the external environment is that Arizona has grown to be a place with enough resources to make it attractive for students and researchers from all of the USA and beyond. The **state had decided to invest an increasing amount of money into the (higher) education system**. Before that, the university system in Arizona has largely been neglected. While other states like California kept adding new campuses,

the university system in Arizona remained at three campuses – University of Arizona, Northern Arizona University and ASU. Thus, not only ASU but also the University of Arizona, for example, made the strategic decision to grow, to open new campuses and to expand the undergraduate population. An interviewed Associate Professor at the ASU Global Institute of Sustainability describes the situation in Arizona during the 1990s and early 2000s:

“We still have not caught up relative to other schools. The state of Arizona is still underserved.”

The **growth process of the university system in Arizona** was also accompanied by new research and funding programmes for universities as an incentive to become more outward oriented. Also, the notion of integrated or integrative research grants has become foregrounded in research funding during that time. These **new funds**, for instance the Technology Research Innovation Fund (TRIF Fund), **came with a lot of flexibility** in them.¹¹ Also, national research funding agencies like the National Science Foundation (NSF) or the National Institutes of Health (NIH) set up new programmes or re-issued calls and considered more integrative and explicitly interdisciplinary proposals.¹² These increased funding opportunities for universities in Arizona facilitated institutional change.

In general, ASU has started its transformation process in 2002, partly responding to external developments such as the **exclusive and elitist approach of many leading US higher education institutions** (Crow and Dabars 2015a, Randles 2015), partly anticipating them such as the changing expectations of the government of the State of Arizona, which created a highly competitive framework among Arizona’s higher education institutions as regards student numbers and degree awards (ASU 2013). **ASU’s location in a desert region** and its enormous growth in terms of new buildings and on-site community created challenges which ASU has started to proactively address by its sustainability efforts.

¹¹ For further information on the Technology Research Innovation Fund, see: <https://repository.asu.edu/items/16525> (last checked on 12.08.2018).

¹² See for example the program „Smart and Connected Health“ through the National Science Foundation: https://www.nsf.gov/funding/pgm_summ.jsp?pims_id=504739 (last checked on 12.08.2018).



This growth trajectory has put ASU into an advantageous position and also in competition with other research organisations in the country as a director of an interdisciplinary research centre at ASU states:

“So we have no problem now finding faculty in competition with all of the big schools. In fact, we have an advantage in the sense that housing prices are low here and yet we pay University of California scale salaries.”

A further condition that facilitated the rapid and profound institutional change that took place at ASU starting in 2002 was a **lack in strategy, vision and leadership** before Michael M. Crow took over office as one interviewee pointed out:

“I think he [Crow] liked ASU because he had a lot of freedom here to try new things that he might not have been able to try in other places. So, that maybe is where it started, it had a lot of freedom. It didn’t have much of any strategy and that was really, I think, what we lacked at that time, was any kind of real strategic vision of where we were going and what we were doing.”

The lack of strong leadership and vision facilitated institutional transformation through institutional entrepreneurs. That made it easier to try out new paths in research at ASU as institutional resistance was much lower than at other, more established and more traditional schools:

“I won’t say it was completely the Wild West, but it was much more open venue than many of the more established schools were, in terms of flexibility to try out new things [...]. And, it was much more open to broad collaboration across colleges and units, than many universities were. It once was a blank canvas, but it offered a lot of opportunity for change and for trying things that were very new and very different than, let’s say, Harvard or other well-established universities.”

Hindering Factors for institutional change within the external environment

Barriers to the institutionalisation of rri at ASU are often related to different institutional logics within the research system as well as to conflicts of interests. References in the 35 interviews indicate hindering factors especially regarding ASU’s mission of inclusiveness and its focus on use-inspired and inter- and transdisciplinary research.

For example, the **mission of inclusiveness faces practical problems** particularly in daily routines. According to its charter, ASU wants to be measured by whom it includes



and not excludes. Most interviewees agreed on that aim and try to embrace the goal of inclusiveness. Some, however, also see discrepancies in ideological goodwill and daily practices. This discrepancies become evident **especially in staffing and hiring procedures** as a Physics Professor at ASU explains:

“[Staffing process] tends to be biased against economic minorities because economic minorities have a tendency to be less well-prepared when they go into the first steps of education and so they’re less likely to be in the hottest lab at Harvard by the time they get to the post-doctoral part of their study. And so the question is: Is that good for ASU to only hire people that had all the advantages [...]? It’s easy to get consensus when everyone’s sitting in a room and it’s all theoretical. It’s much harder when you’re looking at a set of files and you say, oh my gosh, this person has done all this fantastic and interesting work, we have to hire this person. And, then you say well, is this person actually the best for us? And [...] that’s a difficult calculation.”

Also, the **inclusion of students with various backgrounds and levels of knowledge** turns out to be **challenging for teachers** to provide them with the necessary skills in order to succeed in their study programmes. Students from underrepresented categories and of lower financial means often arrive with deficits on that need to be adjusted by giving them extra tutoring, mentoring, additional coursework, etc. A director from a natural science research school reports:

“One of the challenges of the inclusivity of ASU that we see at the school level is: We get students who come in with varying levels of background in terms of preparation for succeeding at the university level. And so, it becomes a challenge of how do we take the students who are, do not have as good of a background and bring them up to where they need to be to be able to succeed in the school. And it is a challenge; it is an issue that we deal with virtually every day.”

Moreover, **existing approaches in academic training and qualification** within the university system in general was criticized as **being old-fashioned** as it still adheres to overcome modes of knowledge production as a Professor and Associate Dean at a Graduate School at ASU explains:

“We still have a 19th century model for training and academics: Single venture, single student, student does his/her own work and they publish a PhD thesis at the end of it. And I say that as 19th century because it is not the way almost any kind of academic



endeavour takes place in the 21st century. I have six grants [and] every one of them is a team driven grant.”

Besides, **evaluation processes** often **still focus on individual academic achievements** and have problems to appreciate research in social context. Especially in hiring and promotion procedures **individualism is still higher rewarded** as another Professor confirms:

“[There is] a problem with evaluating interdisciplinary research. I would say there’s always been a bit of an academic bias towards individualism, and so, when people come up for tenure, there is a tendency to say: Did you do this yourself? I think we are slowly moving towards an understanding that teams are very important. We can value people that work well in teams and not necessarily as the leader. But that is a slow cultural shift in academics. Academics tend to value, to be very blunt, the alpha male concept of the scientist.”

Another interviewed senior professor with leadership function refers to that challenge, especially when it comes to promotion and tenure:

“If you have people who are really good in co-working and building teams, when it comes to promoting them for tenures, it is hard to assess their individual contribution.”

The interviewees indirectly refer to a process that Gibbons et al. describe as the new way or “Mode 2” of knowledge production. Whereas traditional knowledge was mainly generated within a disciplinary, primarily cognitive context, the new – “Mode 2” – knowledge is created in a broader, transdisciplinary, social and economic context (Gibbons et al 1994, Nowotny et al. 2001). University structures within the university system as well as evaluation and review procedures however very often still rely on these traditional, monodisciplinary values of knowledge production. In fact, the **lack of reward and acknowledgement of inter- and transdisciplinary research within the university system** is seen as a barrier for researchers to engage in activities beyond disciplinary borders. An interviewed member from the ASU management states:

“Many places do engage these days in interdisciplinary research. But if you talk to them, some of them will tell you that still the tenure promotion as one example, policies and processes value people being strong in their disciplines. If they do not account for the people going out and working across disciplines as part of the criteria of evaluating their progress and their contributions, then you will find it hard pressed to motivate people to want to engage. Even if they have the desire to do that, it is hard

for them to motivate themselves if that does not count for their progress and how they are seen and recognised by the institution.”

Also, **outreach activities and engagement** within research is **not really valued** within the university system. Researchers waiting on tenure then rather decide to concentrate on traditional research activities, even if they are interested and motivated to work together with society, as a senior staff member dealing with social embeddedness reports:

“I have recently learned that other universities are grappling with the promotion and tenure process and how it really excludes community engaged scholars. It does not really reward the kind of work that they do and a lot of those scholars are being told: ‘Hey, forget this community engagement stuff until you are tenured faculty and then you can go back and revisit.’ And so then you have these ambitious, deeply passionate young scholars who want to engage with community organisations and populations but do not have a clear path to tenure while doing that [...]. I understand that professors who are up for tenure, their portfolios have to be reviewed by other institutions, and so how do you deal with the fact that other institutions do not necessarily embrace the same ethos?”

Even though ASU has taken the approach of recognising interdisciplinary and transdisciplinary contributions in the evaluation process of researchers, the **barriers remain when (most) other universities still adhere to traditional standards** for promotion and tenure. Furthermore, an interviewed Dean at ASU describes that the contribution of a researcher is often evaluated by external experts outside the university:

“I cannot single-handedly change that because our tenure and promotion processes are very largely driven by peer evaluation of the value of somebody’s work both internally and then external experts in the sub-field of outside.”

In fact, some interviewees see a **tension when ASU is implementing different evaluation standards** to evaluate the work of researchers that are diverging from other universities. Another interviewed Dean at ASU explains that diverging evaluation standards can pose problems for researchers transferring between universities:

“[...] Once you start offering a standard that is quite different than other universities, there is a tension. Can the person go from your university to another university? Does your school lose respect of peers? Which is problematic for a whole bunch of reasons. So there is a tension.”



Besides, external **review panels are often set up by academics who are trained to be disciplinarians**. They usually struggle to evaluate the contribution of interdisciplinary articles and proposals for funding as a Professor at the School for the Future of Innovation in Society explains:

“When I set on review panels I have seen over the past five years that we are just starting to inch into respecting inter-disciplinary methods. The fear that penallists have is: ‘Oh, I do not know how this method works, so I cannot evaluate the integrity of this proposal.’ So, that is a challenge I think for grant bodies to, you know, compose panels that can have an expert in this discipline and an expert in that discipline and that they both trust one another’s expertise and one another’s judgement of the methods of a proposal.”

At the same time, it is perceived as a big **challenge to implement inter- and transdisciplinary research** and thinking, especially among students, **and to assure profound knowledge and know-how within a certain discipline**. Excellent interdisciplinary research depends on deep disciplinary knowledge. Disciplinary training is crucial to be able to connect to other disciplines as a senior professor with leadership function describes:

“The best way to engage undergraduates in interdisciplinary research is through interdisciplinary undergraduate research projects while ensuring that they are also getting sufficient depth in whatever discipline they are building. Because it is hard to be interdisciplinarity if you do not have a discipline, right? That is, I think, the other challenge with interdisciplinary research, like sometimes people just are like: ‘Oh, well, we just will not go deep on anything.’ But that is not how interdisciplinary research works. It is actually, you go deep on multiple things and are able to make changes at another level because the humanist has the depth in Humanities, and the computer scientist has the depth in Computer Science.”

Another Professor at the School for the Future of Innovation in Society refers to **“different languages and cultures” that students have to learn** when they want to engage in interdisciplinary research projects or study programmes:

“You have to go through that embedding process multiple times in order to really be part of these multiple fields which is what you have to do: Learn the different codes of disciplines.”



The **strong impetus for interdisciplinary** research and collaboration beyond faculty and unit borders at ASU does not come without some disadvantages. Some interviewed **researchers feel disconnected from other colleagues**, which causes a loss of common sense of identity and allegiance as one Professor complains:

"[Some see] a loss of sense of community in some places. So, one thing that I think people in this unit find disturbing is the fact that we're now spread out all over the place. And so, you lose a sense of identity when that happens. We're in six buildings across campus, and people are associated with other things. They're associated with the Biodesign Institute, they're associated with the Global Institute of Sustainability and they're associated with the Biophysics centre or whatever. They are often joined between different departments and different units, and so their allegiances are spread in many different ways. And so it becomes much more difficult to get the sort of esprit de corps that you would get if you had a chemistry department sitting in a building where we all went to the same seminar and we all did the same thing."

JERRI



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Summarizing the analysis in this chapter on issues of vertical multi-level alignment, we identify the following success factors and challenges in the external environment of ASU:

Success factors in the external environment:

- growth period and expansion of the Arizona University system during the time of institutional change
- new flexible research funding programs on state and federal level that facilitated use-inspired research, outward-oriented proposals with an inter- and transdisciplinary perspective
- Leadership vacuum and lack of strategy and vision within the organisation beforehand facilitated the development and implementation of goals and strategies for new management personnel.

Hindering factors in the external environment:

- Mission of inclusiveness and coping with different backgrounds of knowledge among students poses practical problems in teaching.
- Evaluation processes in academia still focus on individual academic achievements and struggle to acknowledge teamwork.
- lack of reward and acknowledgement of inter- and transdisciplinary research within the (national) university system and in academia in general
- Diverging evaluation standards at ASU and at other universities pose problems for researcher mobility.
- External academic review panels are still structured and organized along single disciplines impeding the evaluation of inter- and transdisciplinary research proposals.
- Implementing inter- and disciplinary research and teaching programs and assuring deep disciplinary competences at the same time turns out to be a challenging task.
- Strong structural focus on inter- and transdisciplinary research can lead to a loss of identity among researchers of the same field.



4 Potential links to the EU RRI approach

All in all, the operationalization of the European concept of RRI into its **five key dimensions** is not known at ASU. In the interviews at ASU, often clear linkages between ASU's mission and some of the RRI keys appeared. Regularly, these were “**Science Education**” and “**Engagement**”. There are only few efforts at ASU regarding **ethics**, **gender** and **open access**, and these are not linked explicitly to ASU's mission and are therefore not core focus within university strategy. Referring to gender equality, for example, an interviewed PhD student reports:

“I think that gender and culture here [at ASU] is largely dealt with on the level of sexual violence and breaking the law. Which is just the tip of the iceberg if you ask me, if we are talking about inclusion of women or leadership of women in science, in the scientific establishment, right? [...] Also, here in the university, you are going to find that commitment only in people that are doing gender women studies and they will have the very cutting edge progressive understanding of it. But does that go back and change the university culture? No it does not.”

When it comes to **ethics**, there is no common opinion to what extent researchers should commit themselves to ethical reviews of their research activities and results. Some interview partners do not perceive this as a special task for researchers as a senior scientist and head of an interdisciplinary research center remarks:

“As a matter of personal feeling about scientific responsibility, there are things that I would argue should not be carried out in university research environment [...]. There are indeed enormous potential ethical problems with that. But having said that, the actual thing that would decide how people behave is in fact markets [...]. The scientific community can warn of risks of technologies, but [...] a much broader approach to these problems is needed [...]. There are some areas where the community needs to regulate itself and maybe even have legal regulation. But as a last resort, because I can't think of an activity in which free speech is aware is more important than science.”

Consequently, ASU's design principles and its understanding of responsible research are not directly comparable with the European RRI keys, which are rather themes or fields of action. Nevertheless, ASU is also active in the fields of ethics, gender equality and open access although the rationale for these activities does not originate in ASU's mission. The concept and the European discussion about RRI are known to a few key faculty members of the Center for Nanotechnology in Society (CNS) and the respective



School for the Future of Innovation in Society. There is academic exchange and ASU faculty members are involved in European-funded research projects on RRI such as JERRI.

When comparing the ASU approach to responsibility with the European RRI-framework we see a significant difference in the strategic orientation. Both approaches seem to follow quite different strategic directions. With its emphasis on use-inspired and impact-oriented research, **ASU's design aspirations rather focus on research outcomes**. ASU explicitly aims at transforming the society with research activities. It strives for global engagement, while being socially embedded at the same time. The concept of responsibility is equated with societal impact. Interdisciplinary and transdisciplinary research is perceived as a key to achieve a higher societal impact. Besides, lots of projects and research activities described in the interviews have a strong outreach component. Actors outside the research system, like residents in the neighbourhoods, are actively integrated, e.g. by defining the problems and need for help or as the core recipient of the research results. According to this understanding of de-facto rri at ASU, all research activities that have some (positive) impact on society are automatically seen as “responsible”. However, the concept of impact is very diverse and defined differently by our interview partners. Moreover, the university's design aspirations are also influenced by socio-political shortcomings of the public welfare state. ASU tries to deliver public goods where social systems fail to do so. Many activities regarding community engagement or cooperation with health care service providers are motivated by an impetus to tackle (local) social problems and to improve the quality of life of the people.

In contrast to this definition of de-facto rri, **the European RRI-approach with its five strategic pillars** – public engagement, open access, gender, ethics, science education – **rather tends to focus on the research processes** and the way research should be designed and articulated. Instead of taking impact of research outcomes as a benchmark like ASU, RRI asks how research itself can be responsible. To put it pointedly, the **European RRI concept concentrates on “how to do research”**, while **ASU design aspirations rather ask “what to research”**. Both concepts have their own institutional settings. Nevertheless, they offer potential for mutual learning.

The following table relies on a summary of the first part of the ASU case study from the point of view of RRI as it is operationalised in the EU's H2020 program. After having analysed 35 in-depth interviews with researchers and staff at ASU, the table was complemented in particular by approaches and attitudes relating to RRI that were



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identified in the interviews. It displays information which has been presented in this case study about ASU's mission and activities. Looking at it from the European "RRI lens", the focus of ASU's actions is in the key dimensions of science education and engagement.

The table also adds some information and examples about ethics, gender equality and open access policies and activities at ASU. They are not discussed in depth in this chapter as, in both fields, discussions at ASU and in Europe seem to focus currently on different aspects: Gender-sensitive R&I as well as open science or open data are hardly addressed by current efforts at ASU.



Table 2: Summary of main findings about RRI-related issues and good practices at ASU

RRI key	Rationale/Definition at ASU	Keywords	Good practice (selected)
Science Education	<ul style="list-style-type: none"> - ASU focuses on all levels of tertiary education with the aim to - scaling up the number of student enrolments with a particular focus on underrepresented and socially disadvantaged groups; - ensuring high quality education (which is at the same time more efficient) by employing technology and being innovative in new teaching and learning methodologies; - fusing intellectual disciplines by offering interdisciplinary degrees and encouraging graduate students in taking courses in other schools; - cultivating civically engaged students and student level change making - There is also a strong commitment to earlier phases of education by teacher education and by engaging in a broad number of projects with elementary education in the region. 	<ul style="list-style-type: none"> - inclusion - accessibility - social embeddedness - social value - fuse intellectual disciplines - transform Society - outreach 	<ul style="list-style-type: none"> - websites to provide outreach educational material - “Ask a biologist” – tool for children to address for questions about biology - recruitment and access programs, financial aid and mentoring - ASU Online (Campus)



RRI key	Rationale/Definition at ASU	Keywords	Good practice (selected)
Engagement	<ul style="list-style-type: none"> – The ambition to engage non-academic actors in research processes is not made as explicit as it is in Europe. “Use-inspired research” means for ASU problem-driven research, and the ambition focuses on treating use-inspired research at eye level with basic research. This may include (but not necessarily) collaboration with business and industry and other users of knowledge. – ASU’s commitment to partnerships and outreach programs is part of the definition of “social embeddedness”, mutually beneficial partnerships at local, regional, national and international level. 	<ul style="list-style-type: none"> – social embeddedness – transform society/public mission – community service – globally engaged – mutual benefit – social value – outreach – service learning – sustainability – use-inspired research – entrepreneurship – impact-driven – inter- and transdisciplinary research 	<ul style="list-style-type: none"> – new incentive structures like the Knowledge Mobilization Awards – engaging external partners – decentral – facilitated by internal network structure, instead of hierarchical organisation
Ethics	<ul style="list-style-type: none"> – ASU is rolling RCR training regardless of sponsor. – research integrity policy implementing federal state and university regulations governing research – However, there is no uniform opinion among interviewed ASU researchers to what extent researchers should dedicate themselves to ethical reviews. 	<ul style="list-style-type: none"> – animal care – biosafety – involvement of human subjects – responsible conduct in research (RCR) – objectivity in research – security and exports control – scientific diving 	<ul style="list-style-type: none"> – Responsible conduct in research (RCR) is an ethical training following requirements by the National Science Foundation (NSF).



RRI key	Rationale/Definition at ASU	Keywords	Good practice (selected)
Gender Equality	<ul style="list-style-type: none"> – Debate on Gender Issues focuses often on topics like Sexual harassment and less on real Gender Equality – Commitment to Gender Equality is rather seen as a response to state legislation – Most important topics in gender policy and activities are (research) career opportunities for women. 	<ul style="list-style-type: none"> – diversity – inclusion – (research) career opportunities – dual career support 	<ul style="list-style-type: none"> – The Faculty Women Association provides career development, networking opportunities and an award for outstanding faculty mentors.
Open Access	<ul style="list-style-type: none"> – ASU supports Green Open Access by its Digital Repository (including data). – There is also support for Gold Open Access through a number of memberships with open access publishers. – Open access activities are linked to the ethical principle of information being unchained, but they are not explicitly linked to the mission of ASU. 	<ul style="list-style-type: none"> – Green Open Access – Gold Open Access – The main target group of the repository is the research community. – Unchained access to information. 	



5 Conclusion

All in all, the ASU case study has given insights on a global rri “cosmos” where rri stands for de-facto responsible research and innovation as opposed to Responsible Research and Innovation (RRI) as it is coined by the European Commission in Horizon2020. ASU operates based on rationales which increasingly respond to new understandings of responsibility, and this means a new or adapted conceptualisation of their roles within society and their linkages to society. In its operations however, there is no reference to the five key fields of action as in the European approach. ASU operationalizes its rri-related activities along eight so-called design aspirations, which are “Leverage our place”, “Transform society”, “Value Entrepreneurship”, “Conduct use-inspired research”, “Enable student success”, “Fuse intellectual disciplines”, “Be socially embedded” and “Engage globally” with a priority on accessibility to a diverse student body.

The 35 conducted in-depth interviews with researchers and staff at ASU provided evidence for the existence of several dominant narratives with relevance to rri. Most interview partners shared a commitment to responsibility. Responsibility was usually referred to impact and use-oriented research. Most interviewees understand responsibility in research as a goal to transform society and to help tackle societal problems. Other core values that were shared among the interview partners are inclusion and social embeddedness. We also found evidence of a positive attitude towards the image of an Entrepreneurial University. Such a university is characterised by a strong leadership, it proactively creates its future, embraces creativity, transfers knowledge and technology into society and also looks for a diversification of funding streams, e.g. through tuition fees, commercialization activities or by approaching new donors such as donations and philanthropic foundations. As a matter of fact, responsible research is no end in itself but also related to a business model and unique features that increase the legitimacy of a university. Consequently, responsible research and societal impact is closely linked to organisational and economic success. The design aspiration and the particular strategic orientation of ASU have helped to develop the unique selling point of the university in a competitive university and research sector. New research areas and topics have helped to tap new streams of funding and facilitated a remarkable growth process. Responsibility and success represent two sides of one coin and strengthen the legitimacy of the university and research in general.

In response to change rationales and the above mentioned narratives, ASU has developed new structures and practices. It shows evidence of “deep institutionalisation”



as the maturation process has also touched upon organisational design or incentive structures. This meant a rigorous re-organisation of a large number of academic and research units into transdisciplinary schools and centers. At the procedural level, it turned out that discussions and negotiations around responsibility goals can hardly be separated from the levers and barriers of institutionalisation. The rich and detailed experience of success factors and challenges for institutionalisation at ASU are transferable to the situations of Fraunhofer and TNO. Moreover, as “governance virtues”, such as organisational re-design, new incentive structures or new integrative practices proved to be effective for ASU. As governance is context-sensitive, European institutions might want to employ European good practices such as the governance categories presented in the Res-AGorA Responsibility Navigator.

The case study showed that change process needs institutional entrepreneurship. Documentary research and the in-depth interviews showed that strong leadership with new visions for the organisation plays an important role in particular through consistent communication of the narrative that provides legitimacy for change. A central instrument for institutional entrepreneurs in organisations to achieve systemic consolidation that was identified in the interviews is a new way in hiring and staffing procedures. As various interview partners confirmed, ASU tries to sustain its institutional translation through hiring people with a mind-set that embraces the design aspirations of ASU. Besides, ASU implemented a Leadership Academy to secure strong like-minded leaders. Due to the complexity of the organisation, institutional entrepreneurship is also needed decentrally at lower levels of hierarchy in the organisation. There are manifold examples of researchers at ASU who are able to deal with a large set of different performance criteria. We also found boundary spanners who connect units within the organisation and outside the organisation with different cognitive frameworks. At ASU, boundary spanning is fulfilled by several central service units and has at the same time proliferated to the Principle Investigator (PI) level – at least in the interdisciplinary schools and research centers.

The external environment also placed a pivotal role for the vertical multi-level alignment of rri. The state of Arizona, for example, developed a new strategic approach to higher education, which caused ASU to massively expand its study programs, resulting in a significant increase in the number of enrollments. However, the interviews also revealed factors hindering a broader institutionalisation of the rri-related design aspirations. Researchers and staff face obstacles due to systemic persistence. Various interview partners reported problems regarding new reward structures, evaluation standards and



promotion procedures at ASU as they are diverging from conventional standards in the research system. While ASU is striving for evaluation standards that recognize in particular interdisciplinary research, research in social context, team-driven research projects as well as outreach activities and evaluation processes outside, ASU mainly focus on individual and mono-disciplinary achievements. As researchers are dependent on external evaluations, the diverging foci pose a conflict of interest for many researchers.

At the same time, we find at ASU a high differentiation of individual orientations and responsibility conceptualisations. This is certainly a logical consequence of the fact that especially principal investigators are confronted with a diverse set of performance requirements in particular at times when existing rationales of an organisation co-exist with new understandings which rather add to the organisational self-conceptualisation than replace it. The new rri-type narratives are indeed shared by many in the organisations. However, we also find that still after several years of evolution shared understanding remains often at the surface. Central terms rather serve as umbrellas for a diverse set of activities. Yet, one could also see these broadly used concepts as further boundary objects that help researchers and staff at ASU to enter a communication process and as boundary objects that help to try to collect different approaches to engage people and to link them together. As an Associate Professor at the Global Institute of Sustainability remarks: "It is such a big institution and we never will have a joint understanding of the definition [of rri]." As a consequence, the empirical findings of the case study may open up perspectives beyond the official EC definition fragmented into five RRI dimensions, thereby helping to set individual and organisation-specific emphases of "what should be reached". In particular, concepts such as "empowering citizens", "open science" and "social value" can help to shape the discussions around common values underlying specific goals for the institutionalisation of rri. Not least, existing rationales and long-standing experience in rri-relevant fields are the points of departure for both Fraunhofer and TNO. In that respect, ASU developments and experiences and good practices after at least a decade of change might provide inspirational sources for Fraunhofer and TNO.

Both the European RRI concept and ASU's impact-oriented design aspirations contain interesting elements and potentials for mutual learning processes. In fact, the European approach could be complemented by a more change- or impact-driven rationale. Is research per se more responsible when the research process is open and integrative? While focusing on responsible and integrative research processes, ASU rather defines



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its concept of responsibility according to societal impact. At the same time, one could critically discuss ASU's frame and question if and to what extent research activities can be responsible and impact-driven when issues like gender equality or ethics are not strategically considered at all. Also, the role of markets in research could be discussed. How sustainable are research agendas that are predominantly driven by political mission(s) instead of research target groups or markets? Can the image of an entrepreneurial university and commercial success really serve as a guiding principle for responsible or real impact-driven research? These questions arose during the analytical process of this case study. However, they could not be thoroughly answered through qualitative interviews. A joint workshop or a focus group with reserachers from both sides should deal with these questions and create synergies for a deeper mutual understanding of responsible research.



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ABBREVIATIONS

ASU	Arizona State University
AzTE	Arizona Technology Enterprise
CNS	Center for Nanotechnology in Society
FhG	Fraunhofer-Gesellschaft
Fraunhofer ISI	Fraunhofer Institute for Systems and Innovation Research
IPM	Institute of Policy and Management
JERRI	Acronym for the project Joining Efforts for Responsible Research and Innovation
MIT	Massachusetts Institute of Technology
NAU	New American University
NIH	National Institute of Health (NIH)
NSF	National Science Foundation
PI	principal investigator
R&I	Research and Innovation
RCR	Responsible conduct in research
RRI	Responsible Research and Innovation
TNO	the Netherlands Organisation for applied scientific research TNO



ANNEX I

Interview Guideline

JERRI – Joining Efforts for Responsible Research and Innovation

State of the art on existing practices and attitudes in the field of Responsible Research and Innovation

Interview Guideline

Background information

You are invited for an interview regarding your organisations' current practices on responsible research and responsible innovation. The interview is part of the EU project JERRI - Joining Efforts for Responsible Research and Innovations (RRI) – and will help the project to understand the current state-of-art on RRI. The goal of the project is to foster Responsible Research and Innovation (RRI) transition in Europe by developing and testing good RRI practices. Further information on the project can be found in the project leaflet.

In this first stage of the project, we are organizing interviews within representatives from the Chinese Academy of Sciences (CAS) and Arizona State University (ASU) in order to enable bottom-up insights on the actual state of play of organisational orientations and practices, which can be attributed to Responsible Research and Innovation. Your input is very valuable in order to understand how different practices are perceived and apprehended by stakeholders inside your organisation.

The interviews will be carried out either face-to-face or by phone. Each interview will take one hour at the maximum. Your interview will be used for analysis and publication of relevant results in a public report. Data protection will be ensured according to our data protection statement.



Proposed interview structure and topics

Section 1 “The interviewee and its organisational context”

- Background, responsibility and tasks
- Understanding of what it means to ‘act responsibly’

Section 2 “De-facto responsible research and innovation”

- Discussion of individual understanding of responsibility in research and/ or innovation and consequences for own work

Section 3 “Responsible Research and Innovation (RRI)”

- Awareness of RRI terminology, discussion of different understandings of RRI in Europe as compared to other places in the world
- Rationales driving the practices of responsibility within [unit / department / institute / organisation as a whole]

Section 4 “RRI practices”

- Information on existing RRI practices specific to the respective RRI key dimension, as defined by the European Commission (Ethics, Gender, Open Access, Societal Engagement or Science Education) plus other important RRI practices as defined by organisation (e.g. with respect to sustainability, social inequality, e.g.)
- Influence of RRI practices on research planning (agenda), research practices and further processes at [unit / department / institute / organisation as a whole]; plans for the next months and years
- Further units, departments, institutes or other levels of the organisation particularly active in RRI practices

Section 5 “Issues for the realisation of RRI within organisations (“institutionalisation”)

- Examples of successful realisation of RRI within attitudes and practices of the organisation
- Reasons for success and for remaining challenges to a successful institutionalisation
- Desirable further transformation(s) within organisation and resources needed for this