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Active and Healthy Ageing as a Wicked Problem: The Contribution of a Multidisciplinary Research University

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Abstract. The quest for an active and healthy ageing can be considered a "wicked problem." It is a social and cultural problem, which is difficult to solve because of incomplete, changing, and contradictory requirements. These problems are tough to manage because of their social complexity. They are a group of linked problems embedded in the structure of the communities in which they occur. First, they require the knowledge of the social and cultural context in which they occur. They can be solved only by understanding of what people do and why they do it. Second, they require a multidisciplinary approach. Wicked problems can have different solutions, so it is critical to capture the full range of possibilities and interpretations. Thus, we suggest that Università Cattolica del Sacro Cuore (UCSC) is well suited for accepting and managing this challenge because of its applied research orientation, multidisciplinary approach, and integrated vision. After presenting the research activity of UCSC, we describe a possible "systems thinking" strategy to consider the complexity and interdependence of active ageing and healthy living.

Keywords. Università Cattolica del Sacro Cuore, Research University, Multidisciplinary Approach, Healthy Living, Active Ageing, Wicked Problem, Systems Thinking, Knowledge Mobilization

Introduction

European universities are crucial players in supporting European competitiveness, economic growth, and social cohesion, resulting in the need to focus on quality, efficiency, and excellence. In this process, however, university quality cannot be assessed only by using industrial quality models [1]. This approach works well for standardized services, such as ICT services or student administration, but not for assessing the real influence of a university on the key social and economic challenges.

In particular, we suggest that universities have to be evaluated for their role in the solution of wicked [2; 3] social and cultural problems that are difficult to solve because

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of incomplete, changing, and contradictory requirements. Typical examples of wicked problems are active and healthy ageing, poverty, immigration, unemployment, and social determinants of health, to name a few.

Wicked problems are different from classical socio-economic problems [4]. On the one hand, policy makers often discard them as being too complex to bother with, even if they plague our world and touch every one of us. On the other hand, traditional processes cannot resolve them.

As Rittel and Webber [3] noted, these problems have ten specific characteristics:

1. Wicked problems have no definitive formulation;
2. Wicked problems have no stopping rule or criteria upon which to determine "solving";
3. Solutions to wicked problems are not true or false; they can only be good or bad;
4. The list of applicable "moves" for a solution to a wicked problem is incomplete;
5. There is always more than one explanation for a wicked problem, with the appropriateness of the explanation depending greatly on the individual perspective of the designer;
6. Every wicked problem is a symptom of another problem;
7. No solution of a wicked problem has a definitive, scientific test;
8. Solving a wicked problem is frequently a "one shot" design effort, as a significant solution changes the design space enough to minimize the opportunity for trial and error;
9. Every wicked problem is unique;
10. A designer attempting to solve a wicked problem must be fully responsible for his/her actions.

As Bennet and Bennet [5] noted:

> "What sort of changes, what kind of knowledge is required to confront this unprecedented challenge to mankind? It is evident enough that changes in individual behavior… as well as changes in cultural and political frameworks that breed them are required. It may be less evident that in order to accomplish those changes our understanding of collective human behavior and our capacity to manage it are key factors. Knowledge about ourselves and the ability to innovate social organization at local and global scales are at the core of human destiny" (p. ix).

In sum, wicked problems are tough to manage because of their social complexity [2; 6]. First, they require the knowledge of the social and cultural context in which they occur. They can be solved only by understanding what people do and why they do it. Second, they require a multidisciplinary approach, as there is not just one solution for wicked problems, so it is critical to capture the full range of possibilities and interpretations.

The quest for an active and healthy ageing can be considered a "wicked problem." According to the European Commission [7]:

> "Demographic ageing is one of the most serious challenges Europe is facing. According to recent projections, the number of Europeans aged 65 and over will almost double over the next 50 years, from 87 million in 2010 to 148 million in 2060. This trend represents a challenge for public authorities, policy makers, businesses and the non-profit sector, especially as it comes at a

time of increasing pressure on public budgets, a steady decline in the number of health personnel and growing demands from older people for care products and services"

In this chapter, we suggest that Università Cattolica del Sacro Cuore (UCSC) is well suited for accepting this challenge because of its applied research orientation, multidisciplinary approach, and integrated vision that also includes Third Mission activities that facilitate their engagement with society and industry, After presenting the research activity of UCSC, the chapter describes a "systems thinking" strategy that considers the complexity and interdependence of active ageing and healthy living.

1. Università Cattolica del Sacro Cuore: A Multidisciplinary Research University

In 2012, UCSC invested more than Euro **27 million** in research activities, and it ranks among the first universities at the national level that devote their own resources. A strong commitment of the five national campus of a university that has **49** institutes, **24** departments, **79** research centres, **5** university centres, 6 spin-off and many laboratories at the cutting edge of technology. In the 2012-2013 academic year, the scientific activity involved **1,650** researchers from **10** macro-disciplinary fields: Mathematical and Computer Sciences - Physical Sciences - Life Sciences - Medical Sciences - Agricultural and Veterinary Sciences - Antiquities, Philological-Literary and History-Art Sciences - Historical, Philosophical, Pedagogical and Psychological Sciences - Legal Studies - Economics and Statistics - Political and Social Sciences.

1.1. The Dimensions of Research

Most of the 27 million of euros were invested in contracts and framework agreements with external partners. The main providers of funds are represented by private entities (businesses, institutions, foundations, associations) that cover almost 50% of total funding to research followed by the research institutes and other public authorities; the European Union and other international public organizations; the Ministry of Education, University and Research (MIUR); and regional or local authorities (Regions, Provinces and Municipalities).

Self-financing accounts for 16% of the total financing, is one of the most significant figures invested in the Italian university system.

1.2. The quality of research

In July 2013, the National Agency for the Evaluation of Universities and Research Institutes (ANVUR) announced the results of the most extensive process that has ever occurred in Italy regarding the **evaluation of the quality of scientific research** (VQR 2004-2010). Overall, 94 Italian Universities UCSC participated to the project, presenting and communicating scientific data and publications related to the research context and its effect on society and industry (the so-called "Third Mission").

With respect to the evaluation of the presented products (for the most part publications), UCSC ranks in the top quartile (25%) of the Italian universities in the areas of **physical, historical, philosophical, pedagogical and legal sciences**. Some other scientific areas - medicine, psychology and economics - also rank well on the national scene.

Overall, UCSC has distinguished itself by the good level of own resource, as well as co-financing of research; for the substantial revenue from direct contracting with enterprises, foundations, organizations and recruiting outstanding new human resources dedicated to research and training.

1.3. The Scientific Publications

The research quality is assessed through the publications of researchers. In 2012, the university released **4,127 publications**, with over **90%** published in the Physical, Environmental, Biological, and Medical Sciences. More than half of these publications were written **in foreign languages** (**57%**). Most publications were written in the areas of medical and biological sciences and various humanities. The data are recorded on *Publicatt*, the institutional repository of publications of the UCSC (http://publicatt.unicatt.it).

1.4. People Involved in Research

The UCSC employs **1,650** researchers as Full Professors (Professori Ordinari), Associate Professors (Professori Associati), and Assistant Professors (Ricercatori). The macro-sector of Medical Sciences employs a little more than one-third of the people involved in research, specifically, about 600 in the 2012-2013 academic year. Historical, Philosophical, Pedagogical, Psychological sciences, and Economics and Statistics comprise 200 researchers each.

1.5. University Spin-offs

The University participates in **6** spin-offs as a partner. Three of them are in the area of Agricultural and Food Sciences:

- **Horta Srl** (http://www.horta-srl.com/)
- **Aat Advanced Analytical Technologies Srl** (http://www.aat-taa.eu/)
- **Aeiforia Srl** (http://www.aeiforia.it/)

One in the area of the physical and environmental sciences:

- **Ecometrics** Srl (http://www.ecometrics.it/eco/index.php)

One in the area of the social sciences:

- **Arethe Srl** (http://www.arethe.eu/)

The sixth one was created in 2012 in the medical sciences field:

- **Ramazzini Work Team Srl** (http://www.ramazziniworkteam.com)

1.6. University Centres

In addition to the departments, centres, and institutes, the University has five University Centres, which serve as the structures for the conception, development, and implementation of research projects, training, and intervention on issues of particular strategic importance as a contribution to the Church and society as a whole.

- **University Centre for Bioethics**: For many years, the Centre has been conducting scientific research and post-graduate training to address the anthropological and ethical issues raised by the development of technology and the medical and biological sciences with reference to the issues of bio-politics and bio-law.
- **University Centre for Studies and Research on the Family**: The activities of the Centre focus on the most critical family transitions, such as the birth of the first child, development of autonomy in adolescence, prolonged youth, old age, separation, and divorce. The research, training, and intervention team of researchers at the Centre is divided into five macro-areas, i.e., family life cycle: teenagers and young adults; community, family associations, and social policies; family and cultural diversity; forms of parenting; and couple relationships.
- **University Centre for the Social Doctrine of the Church**: Recently, the Centre promoted research on the "Ethics and finance" topic that focuses attention on some issues capable of macroeconomic or more specifically sectoral coverage, including finance software in the economy, the banking economy, finance and business, finance and family, asset management, and ethical finance. Archive for the symbolic anthropology operates within the centre, which includes more than 8,000 volumes.
- **University Centre for International Solidarity***:* The Centre works on several international cooperation projects in various cultural and geographical contexts "of frontier", striving to spread the culture and practice of solidarity through the enhancement of the knowledge and expertise of the UCSC.
- **University Centre for Life***:* The Centre aims to deepen the reflection and promotion of advanced research in relation to the knowledge of life and its progress and to promote professional, human, and moral commitment of caregivers towards patients and their families. The research activities and initiatives undertaken recently have analyzed in detail the issue of humanization of care pathways and the dignity of life.

1.7. UCSC towards Expo 2015

The **UCSC Expolab Laboratory** was founded in 2011 with the aim to promote and implement scientific research on the subject of Expo 2015 titled "Feeding the Planet, Energy for Life", utilizing a multi-and interdisciplinary approach and the participation of students and teachers of the University. In the 2012-2013 academic year, the research work was based on the integration of different disciplines with a specific focus on the following areas: food security, food safety, and food-borne diseases; local development and international cooperation, the right for food and human development; and people's needs and environments with an emphasis on cultural representations of the relationship between man and food.

1.8. UCSC in the European Innovation Partnership on Active and Healthy Ageing

The UCSC is a member of the Action Group B3 (on Integrated Care) and Action Group D4 (on Age-friendly Environments) of the EIP-AHA (European Innovation Partnership on Active and Healthy Ageing) committed to the "Positive Technological Innovation as a Driver of People's Health Engagement" (PHE-project). The UCSC's commitment is listed in the Good Practices collection of the EIP-AHA.

1.9. UCSC in the Joint Programming Initiative on "More Years, Better Live"

The UCSC is the chair member (Chairman: Prof. Paolo M. Rossini, Director of the Neurology institute of the UCSC and author of the next chapter) of the Joint Programming Initiative (JPI) "More Years, Better Lives - The Potential and Challenges of Demographic Change". JPI seeks to enhance coordination and collaboration between European and national research programmes related to demographic change. The JPI therefore follows a transnational, multi-disciplinary approach bringing together different research programmes and researchers from various disciplines in order to provide solutions for upcoming challenges and make use of the potential of societal change in Europe.

2. Univesità Cattolica del Sacro Cuore: Ongoing Institutional Research Projects

2.1. Self-financing University Projects

For the 2012-2013 period, the UCSC has invested one million Euro of its own resources in research projects on two topics of great scientific value and strong social importance. All of them are characterised by strong interdisciplinarity involving a large number of researchers from different faculties.

- **Crisis time: Analysis of the causes and perspectives of solution.** Two specific ongoing projects on this subject have been financed: "*The challenges of the crisis: Rethinking the microeconomic and macroeconomic politics*" (Domenico Delli Gatti,) and "*The virtualization of the economy and its crisis. Practices and options of reconstruction between economy and society*" (Mauro Magatti).
- **Extension of life as an opportunity.** The following ongoing projects on this second subject have received financial support: "*Diet and Animal Models of Ageing*" (Paolo Ajmone Marsan); "*Growing older: Activating resources for sustainable lifestyles*" (Alessandro Antonietti); "«*I do not retire»: the extension of life, a challenge for the generations, an opportunity for the society*" (Fausto Colombo); "*Impact of the nutritional state on the longevity and ageing-related diseases*" (Claudio Grassi); and "*Mathematical modelling of the impact of nutritional and environmental factors on physiological parameters in the course of ageing*" (Alessandro Musesti).

The UCSC is financing many other small projects on different topics and across different scientific areas.

2.2. National Co-financed Projects

At the national level, the Ministry of Education, University, and Research (**MIUR**) financed **27** projects, **5** of which were **coordinated** by the university within the framework of **PRIN** (Research Projects of National Interest) **2010-2011 and PRIN 2012**. The financial support was offered to the humanities and social sciences (**13** projects), life sciences (**13**), and physical and analytical chemistry (**1** project).

The projects that the UCSC coordinated nationally included: "*Research of the genetic bases of new health-related phenotypes, the efficiency and the environmental sustainability of dairy cattle products* - Gen2phen" (Paolo Ajmone Marsan); "*Sustainable practices of everyday life in the context of the crisis: Work, consumption, participation*" (Laura Bovone); "*Regenerative Therapy with cardiac and spinal cord stem cells in severe heart failure*" (Filippo Crea); "*The treatment of deafness: Translational approaches*" (Gaetano Paludetti); and "*Functional brain connectivity and neuroplasticity in physiological and pathological ageing*" (Paolo Maria Rossini).

In the same period, the UCSC has been involved in **6** projects funded within the Italian framework programme for young researchers **Future in Research 2012 and 2013**. The winning projects were:

- "Evaluation of the modulation of gene expression of myocardiocytes in response to the abuse/dependence of new psychoactive substances (Smart Drugs) and anabolic steroids" (Fabio De Giorgio);
- "Classical paradigms and theoretical foundations in the contemporary research in formal and material ontology *(OntoForMat)*" (Lorenzo Fossati);
- "Building inclusive societies and global Europe online: Information and political participation in social media from a comparative perspective" (Giovanna Mascheroni);
- "Ultrafast thermodynamics at the nanoscale" (Francesco Banfi);
- "Healthy reasoning. Strategies and mechanisms of persuasion in chronic care" (Sarah Bigi);
- Building and integrating advanced language resources for Latin (Marco C. Passarotti).

2.3. International Projects

At the international level, the main research financing instrument for the UCSC was represented by the **Seventh Framework Programme for Research and Technological Development** (2007-2013), through which the European Commission aims to achieve several objectives, including strengthening the scientific and technological bases of industry, encourage a high level of international competitiveness, promote and encourage research activities in the European Union with a particular focus on small and medium-sized enterprises, research centres, and universities. Since 2008, the university has received funding for **74** projects totalling approximately **€19** million.

3. A "Systems Thinking" Approach to Active Ageing and Healthy Living

The previous description of the research activity currently carried out at the UCSC clearly suggests an integrated approach in which Humanities, Life Sciences, and Physical and Mathematical Sciences work together within a "Systems Thinking" vision that considers problems, including wicked problems, as the sum of different interrelated parts or components (structures) that cooperate in processes (behavior) [8].

In this view, the research conducted at the UCSC is aimed at understanding how systems behave, interact with their environment, and influence each other.

As Kreuter and colleagues [9] underlined, the main characteristics of "Systems Thinking" are (p. 448):

- *The focus on the entire problem*: Systems thinking looks at the whole, the parts, and their interconnectedness;
- *The focus on interdependencies*: The language of systems thinking focuses on closed interdependencies where x influences y, y influences z, and z influences x;
- *The focus on multidisciplinary examination and inquiry*: Systems thinking can be a powerful means of fostering collective understanding of a problem.

What makes systems thinking such a potent strategy for addressing a problem like active ageing? One reason is that systems thinking helps us understand why all the systems and actors involved in ageing and its consequences behave the way they do over time. Specifically, this approach requires researchers to construct and examine models, particularly our "mental models" or assumptions about how the ageing experience works. By exploring our mental models, we deepen our understanding of a problem and through an iterative process, conduct experiments to discover high-leverage solutions. For example, by analyzing the research outcomes related to ageing produced by the many researchers working at the UCSC, it is clear that the mental model of ageing differs according to the specific background. According to researchers working at the Faculty of Medicine, active and healthy ageing requires the prevention of physical frailty and sarcopenia (a syndrome characterized by progressive and generalized loss of skeletal muscle mass and strength). Moreover, researchers at the Faculty of Economics connects healthy ageing directly to the financial well-being of elderly people. Finally, researchers working in the humanities describe healthy ageing as the outcome of social ties, self-esteem, and subjective well-being.

These examples clearly suggest that fragmentation is a critical risk for any strategy related to active and healthy ageing. As Conklin [10] clearly explained:

> "Fragmentation, for example, is when the stakeholders in a project are all convinced that their version of the problem is correct. Fragmentation can be hidden, as when stakeholders don't even realize that there are incompatible tacit assumptions about the problem, and each believes that his or her understandings are complete and shared by all. The antidote to fragmentation is shared understanding and shared commitment." (pp. 2-3).

To avoid this risk, the UCSC uses the "knowledge mobilization" approach [5; 11]. The main goal of "knowledge mobilization" is to combine the sources of knowledge and the beneficiaries of that knowledge to interactively move toward a common direction, such as meeting an identified community need.

In this view, detailed in Table 1, the key in addressing active ageing is a planned process with input from multiple sources in an atmosphere where scientific certainty is balanced by the perspectives of community stakeholders, including elderly people themselves [10]. This book is the first attempt to reach this goal.

Table 1. The competences required for addressing active ageing successfully (adapted from [9])

Required Competence	Description of Competence
Understanding the problem (or problems) that constitute the focus of ageing and active ageing.	A working knowledge of ageing and active ageing, including what is known about the factors and conditions that influence the presence (or control) of ageing and the way in which ageing and its multiple determinants may be linked to other health and social issues.
Conducting an appropriate health and social assessment related to ageing and its consequences.	The ability to identify and assess population health needs, taking into account cultural and historical idiosyncrasies, availability of economic and human resources, and the views and perceptions of multiple stakeholders.
Planning theoretically sound health promotion programs	The ability to define integrated strategies (shown to be effective in previous applications/contexts) to address the needs of elderly people based on evidence from the health and social assessment.
Applying appropriate health promotion strategies	The ability to implement and/or direct the effective implementation of the integrated strategies by the stakeholders involved in health promotion, including (1) community development and community organization; (2) health education programs tailored to the needs of those in multiple settings; (3) specific education of health care providers; (4) social marketing and health engagement; (5) innovation for age friendly buildings, cities, and environments; (6) targeted health communication; and (7) the use of policies and the enforcement of existing regulations.
Applying appropriate health management strategies	The ability to implement and/or direct the effective implementation of the integrated strategies by the stakeholders involved in health management, including (1) prevention, screening, and early diagnosis; (2) health literacy, patient engagement, ethics and adherence programs; (3) ICT solutions for independent/remote/integrated care; (4) acute health care and long-term care; and (5) the use of policies and the enforcement of existing regulations.
Multidisciplinary cooperation	The ability to (1) identify common ground in priorities and unique contributions of different sectors and stakeholders, (2) actively engage those stakeholders in aspects of the program relevant to them, and (3) maintain transparent communication with stakeholders.
Monitoring and evaluating processes and outcomes related to active ageing and healthy living	The ability to (1) routinely monitor relevant health status indicators and their multiple determinants; (2) assess program progress, including the effectiveness of intervention components; and (3) document, disseminate, and use monitoring and evaluation results to publicize achievements and improve efforts.

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