

4th International Conference of Scuola Democratica

Democratic Governance And Workforce Learning In the Twin Transition: A Configurational Analysis Of Italian Manufacturing Cooperatives

Laura Evangelista,
Concetta Fonzo
INAPP, NATIONAL REFERENCE
POINT EQAVET

Massimiliano Mazzanti, Asia
Guerreschi, Ginevra Coletti
UNIVERSITÀ DEGLI STUDI DI
FERRARA, SEEDS

Sapienza University of Rome, Italy – 4th September 2026

TABLE OF CONTENTS

INTRODUCTION

CONCEPTUAL BACKGROUND

METHODOLOGY

RESULTS

DISCUSSION AND CONCLUSION

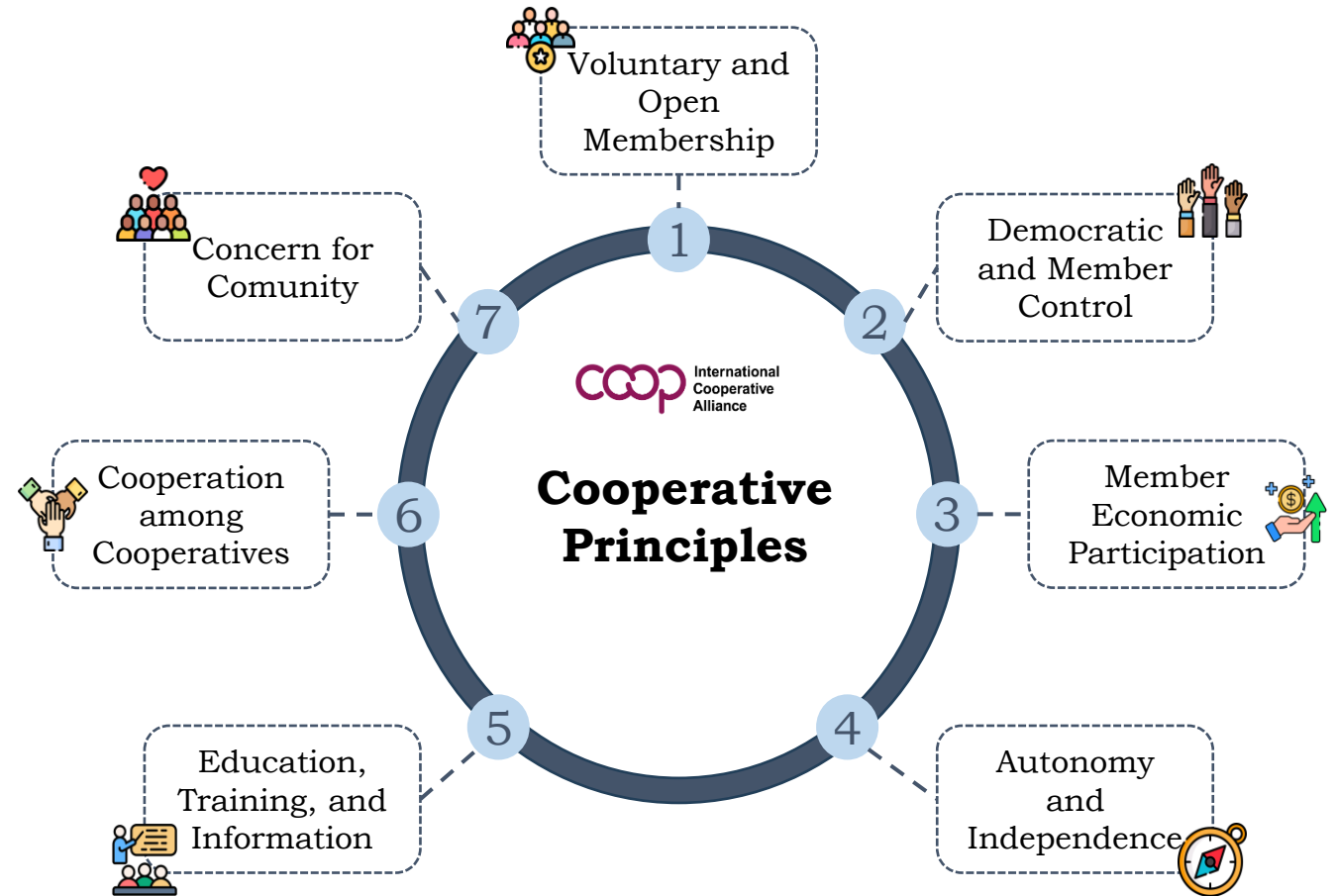


- ❑ The **Twin Transition (TT)** integrates digital technologies and green transformation to support decarbonisation, resource efficiency and Circular Economy (CE) strategies.
- ❑ Achieving these objectives requires changes in technologies and production processes, but also in **organisational models, skills and values**.
- ❑ **Reskilling and upskilling** are essential to enable organisations and workers to adapt to emerging digital and environmental requirements.



INTRODUCTION

- ❑ **Cooperatives** represent a particularly relevant yet understudied actor in the transition.
- ❑ Their **organisational model** may provide a distinctive pathway towards a more inclusive Twin and Circular Transition.



- ❑ Digitalisation and Circular Economy are often studied separately, while cooperatives may integrate them through shared knowledge, local networks and community engagement.
- ❑ Depends on training, reskilling, environmental education and worker-member involvement.
- ❑ Cooperatives often face **resource and capacity constraints**.
- ❑ Using fsQCA, the study identifies the **combinations of conditions associated with stronger implementation** of digital and circular innovation.





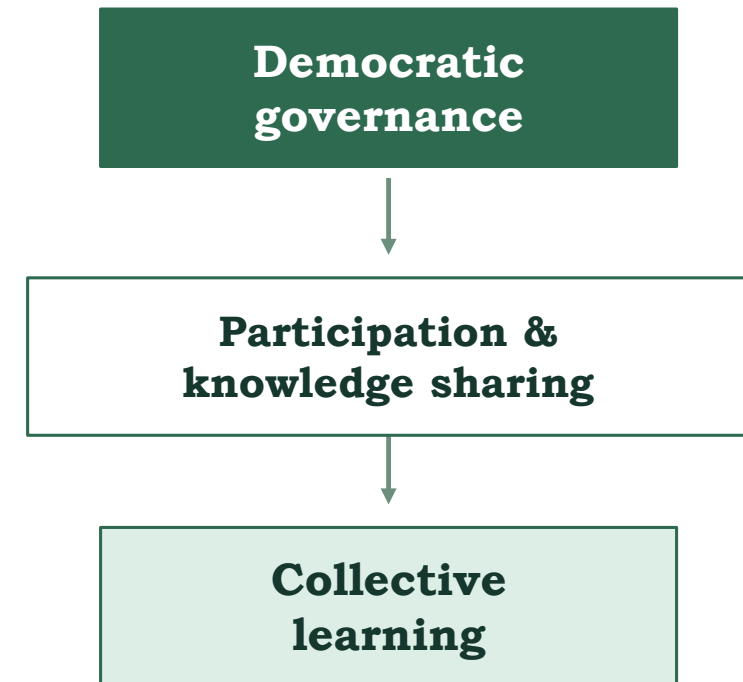
- ❑ **RQ1.** Which configurations of training and organisational conditions support both digital and circular innovation?
- ❑ **RQ2.** When does worker-member involvement in digital and environmental training strengthen these innovations?



CONCEPTUAL BACKGROUND



- ❑ In cooperatives, education and training are part of the organisational model.
- ❑ Democratic governance can support participation, knowledge sharing and collective learning.
- ❑ Worker-members are involved both in production and organisational governance, creating a distinctive link between skills and decision-making.



- ❑ Training provides workers with the competences needed for digital and circular innovation.
- ❑ Worker-member participation and knowledge sharing can help transfer individual skills to the organisation.
- ❑ Training can therefore contribute to the development of collective organisational capabilities.



- ❑ Democratic governance alone is not sufficient to guarantee training, participation or innovation.
- ❑ Innovation depends on how different conditions combine:
 - ❑ training
 - ❑ human capital
 - ❑ worker-member involvement
 - ❑ organisational resources
- ❑ Different cooperatives may achieve innovation through different combinations of conditions.
- ❑ This possibility of multiple pathways motivates the use of fsQCA.



METHODOLOGY



Name	Description (2023)	Unit	Source	Type of Variable
Employees Members	Number of employees that are members	% over total employees	(Guerreschi and Zecca, 2025)	Demographic RQ1
Export	if the cooperative has exported outside their headquarters' nation	binary (yes/no)	(Guerreschi and Zecca, 2025)	Demographic RQ1
Traditional Innovation	implementation of process, product, or organisational innovation	count of type of traditional innovation selected (0-3)	(Guerreschi and Zecca, 2025)	Demographic RQ1
CE Innovation	implementation of circular economy strateg(ies)	count of circular economy strategies	(Guerreschi and Zecca, 2025)	Output for RQ1
Digital Innovation	implementation of digital strateg(ies)	count of digital strategies		Output for RQ1
TT Innovation	implementation of TT innovation	sum of circular and digital strategies		Output for RQ2
Regular Training	employees who were involved in training activities annually	percentage over total number of training hours		Condition RQ2



METHODOLOGY



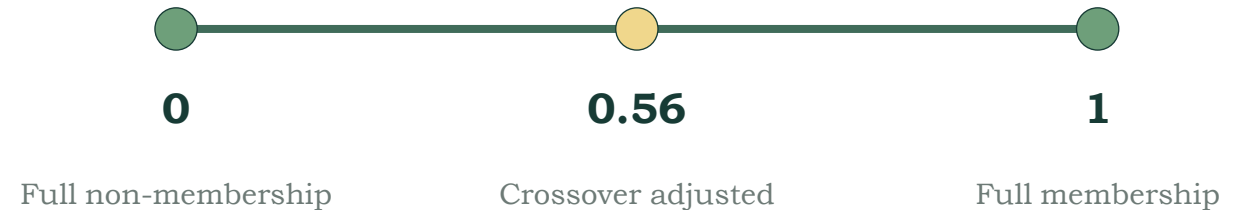
Name	Description (2023)	Unit	Source	Type of Variable
Regular Hours of Training	average number of training hours each employee receives per year	hours/Year		Condition RQ2
TT Hours of Training	percentage of total training hours dedicated to ecological and digital transition topics	percentage over total number of training hours		Condition RQ1
Graduated Employed Members	employees who are members and have graduated university	percentage over total number of employees		Condition RQ2
Graduated Employed Non Members	employees non members who are members and have graduated university	percentage over total number of employees		Condition RQ2
Female Managers	number of managers who are female	percentage over total number of managers		Demographic RQ1
Size	number of employees (members and non members)	count	(Guerreschi and Zecca, 2025) gathered from the AIDA database	Demographic RQ1
Income	latest available income data	million euros	gathered from the AIDA database	Demographic RQ1



- ❑ QCA is a case-oriented approach designed to study **how combinations of conditions are linked to an outcome**. It is particularly useful when the same result may emerge through different pathways.



- ❑ The fuzzy-set extension gives each case a **membership score between 0 and 1**, allowing partial presence of a condition.



- ❑ The interpretation is based on **consistency and coverage**. These metrics should be read jointly: a configuration can be reliable, broad, unique, overlapping, niche, or redundant.

Consistency

How reliably a configuration is associated with the outcome.

Raw coverage

How much of the outcome is explained by a specific configuration.

Unique coverage

The part of the outcome explained only by that configuration, without overlap with others.

Overall solution

Overall consistency and coverage summarize the reliability and explanatory scope of the complete solution.



❑ The analysis is layered, where the demographic variables from RQ1 test results were used in the second test RQ2 that includes additional variables

Test 1.1: [circular innovation] = [size * traditional innovation * export * female managers * income * % training in TT * members employees]

Test 1.2: [digital innovation] = [size * traditional innovation * export * female managers * income * % training in TT * members employees]

Test 2: [TT innovation] = [demographic variables from test 1.1 & test 1.2] * graduated employees members * graduated employees non members * hours of training * employees in training



❑ The analysis is layered, where the demographic variables from RQ1 test results were used in the second test RQ2 that includes additional variables

Test 1.1: [circular innovation] = [size * traditional innovation * export * female managers * income * % training in TT * members employees]

Test 1.2: [digital innovation] = [size * traditional innovation * export * female managers * income * % training in TT * members employees]

Test 2: [TT innovation] = [demographic variables from test 1.1 & test 1.2] * graduated employees members * graduated employees non members * hours of training * employees in training



RESULTS



Test 1.1

Configurations	1	2	3	4	5	6	7	8	9	10
Income	-	-	⊗	⊗	⊗	●	●	●	-	●
Size	-	●	⊗	⊗	⊗	●	●	-	⊗	-
Female Managers	⊗	⊗	-	⊗	-	-	⊗	●	⊗	⊗
Training in TT	⊗	-	●	●	-	●	●	●	●	●
General Innovation	●	●	-	-	●	-	-	⊗	-	-
Employee Members	-	-	⊗	-	●	⊗	-	●	⊗	⊗
Raw Coverage	0.347	0.399	0.277	0.299	0.265	0.333	0.400	0.169	0.289	0.351
Unique Coverage	0.022	0.001	0.003	0.017	0.001	0.001	0.037	0.001	0.000	0.003
Consistency	0.710	0.774	0.747	0.734	0.735	0.777	0.792	0.834	0.760	0.791
Overall solution consistency	0.676									
Overall solution coverage	0.719									

Legend: ● core condition present ⊙ peripheral condition ⊗ condition absent - not specified in the configuration

RESULTS



Test 1.2

Configurations	1	2	3	4	5	6	7	8	9	10
Income	-	-	⊗	⊗	⊗	●	●	●	-	●
Size	-	●	⊗	⊗	⊗	●	●	-	⊗	-
Female Managers	⊗	⊗	-	⊗	-	-	⊗	●	⊗	⊗
Training in TT	-	-	⊗	-	●	⊗	-	●	⊗	⊗
General Innovation	⊗	-	●	●	-	●	●	●	●	●
Employee Members	●	●	-	-	⊗	-	-	⊗	-	-
Raw Coverage	0.451	0.423	0.189	0.227	0.213	0.280	0.373	0.159	0.199	0.283
Unique Coverage	0.073	0.018	0.000	0.000	0.025	0.003	0.048	0.000	0.002	0.000
Consistency	0.164	0.201	0.179	0.176	0.223	0.275	0.263	0.332	0.183	0.259
Overall solution consistency	0.178									
Overall solution coverage	0.682									

Legend: ● core condition present ⊙ peripheral condition ⊗ condition absent - not specified in the configuration

Test 2

Configurations	1	2	3	4	5	6	7	8
Income	-	-	⊗	⊗	●	-	⊗	●
Employee Members	⊗	-	⊗	-	●	●	⊗	⊗
Graduated Employees Members	●	●	●	●	●	●	-	⊗
Graduated Employees Non Members	●	●	-	●	⊗	⊗	●	⊗
Employees in Training	-	-	⊗	⊗	-	●	⊗	⊗
Hours of Training	-	●	-	-	-	-	⊗	●
Raw Coverage	0.196	0.163	0.217	0.142	0.171	0.166	0.113	0.286
Unique Coverage	0.015	0.021	0.018	0.003	0.005	0.010	0.000	0.195
Consistency	0.690	0.700	0.780	0.834	0.724	0.744	0.762	0.750
Overall solution consistency	0.672							
Overall solution coverage	0.567							



- ❑ Circular innovation is more clearly associated with the organisational and training conditions included in the analysis.
- ❑ Training in Twin Transition topics appears repeatedly in the most consistent configurations, especially when combined with income, size, female managerial presence and worker-member involvement.
- ❑ This suggests that circular innovation may depend on the interaction between resources, participation and targeted learning, rather than on general innovation capacity alone.
- ❑ By contrast, the digital innovation model shows very low consistency, indicating that other factors may be more relevant.



- ❑ For Twin Transition innovation, the most recurrent condition is the presence of graduate employee-members.
- ❑ Training contributes to innovation when combined with human capital, worker-member structure and organisational resources.
- ❑ Some configurations emerge even without high income, suggesting that skills and participation may partly compensate for limited economic capacity.
- ❑ Training matters as part of a broader organisational learning process, rather than as an isolated factor.



- ❑ Cooperative democracy may support the Twin Transition when connected to learning capacity, skills and participation.
- ❑ TT training and educated worker-members emerge as relevant components of several innovation pathways.
- ❑ No single condition is sufficient: innovation depends on different combinations of resources, human capital, training and member involvement.
- ❑ The findings are stronger for circular innovation, while digital innovation likely requires additional technological capabilities.

The Twin Transition in cooperatives is not only technological, but also an organisational and collective learning process.



GRAZIE PER LA VOSTRA ATTENZIONE

Massimiliano Mazzanti massimiliano.mazzanti@unife.it

Ginevra Coletti ginevra.Coletti@unife.it

Asia Guerreschi asia.guerreschi@unife.it

Laura Evangelista l.evangelista@inapp.gov.it

Concetta Fonzo c.fonzo@inapp.gov.it