

Reflexive responsibility as a cornerstone of the Industry 5.0

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Abstract

In the paper, the concept of reflexive responsibility is explored, which is seen as a cornerstone of the Industry 5.0 as a basis for the emerging society. People are supposed to choose every day between the actions that contribute to environmental protection and social solidarity, and the actions that contribute to their destruction. Due to the complex, ambivalent and dynamic nature of contemporary social order, these choices cannot rely on a stable normative framework but require ongoing critical re-evaluations and deliberations. This calls for another perspective on responsibility. As the extreme social and technological dynamics prevents it to be prescribed by pre-given norms, responsibility increasingly depends on individuals' abilities to critically observe and reflect the social order as well as their behaviour and their collaboration with others. This implies that people today need to be reflexive to be truly responsible. This kind of responsibility – we will call it *reflexive responsibility* – is inevitable for a sustainable future if rapid technological development, societal dynamics, and sustainability are supposed to coexist. Based on the representative national sample of 912 adults in Slovenia, we show correlations between different types of responsibility and the role of reflexivity played in that regard.

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Keywords: Industry 5.0, reflexivity, responsibility, regression analysis, Slovenia

1 Selected problem and viewpoints of dealing with (Introduction)

This vision of our future society is based on one fundamental presumption— it has to become sustainable in all contexts, let that be economic, social or environmental one. In a broad sense that means that our developmental needs should be accomplished without severing the possibilities of the generations yet to come (Brundtland Report, 1987). Sustainability is thus only imaginable through responsible actions.

Expecting from people to act responsibly is far from new. Traditionally, responsibilities of different members of a society were clearly defined by social values and norms. For most of the humankind history, people knew what is expected from them based on their social positions. However, today, such expectations are increasingly blurred, due to rapid social and technological change. Who should be responsible for what and to what extent? What actions are truly responsible and what actions are just an illusion of responsibility? When one is doing bad things with good intentions? How much informed should one be to be able to act responsibly? How can one select proper information from the increasing scope and variety of sources? Whom to trust and whom not to trust? Until nowadays, people have not had so many possibilities to do the right thing. And also, they have not had so many possibilities to do the wrong thing. Both the potential of choice and the potential of manipulation have reached unprecedented levels.

This calls for another perspective on responsibility. As the extreme social and technological dynamics prevents it to be clearly prescribed by pre-given norms, responsibility increasingly depends on individuals' abilities to critically observe and reflect the social order as well as their own behaviour and their collaboration with others. This implies that people today need to be reflexive to be truly responsible. This kind of responsibility – we will call it reflexive responsibility – is inevitable for a sustainable future if rapid technological development, societal dynamics, and sustainability are supposed to coexist. Reflexive responsibility is seen as a the key building block of the concept Industry 5.0. (Breque et al., 2021) referring to the emerging society.

Industry 5.0 is the innovative, sustainable, human-centric, and resilient upgrading of the digital, data-driven and interconnected industry. It is not only about the technological development but points to the novel social order. This view is based on conceptualising the social orders and their development in terms of technological development interacting with socio-economic settings. Imagining the future social order based on the categorisation of pre-existing social orders or developmental stages has a long tradition in sociology. The historical socio-economic formations introduced by the classical theory of Karl Marx have been subsequently upgraded by the considerations on post-industrial and information society (Bell, 1974; Touraine, 1974). Industry 5.0 is seen as a new stage of merging technological development with production processes, services, and consumption.

The prospects of this emerging society are based on the emerging technological components that include individualised human-machine-interaction, bio-inspired technologies and smart materials, digital twins and simulations, data transmission, storage and analysis, artificial intelligence and energy efficiency, renewability, storage and autonomy (Breque et al., 2021, p. 7). Its organising principles are supposed to be human-centricity, sustainability, and resilience (Breque et al., 2021, p. 13-14).

The Industry 5.0 is therefore build upon the current mutual dialectical influence between technology and society enhanced especially by digitalisation, which is causing a great impact on human interactions, cognition, organisations, and institutions. With the fourth industrial

revolution (Industry 4.0), new technologies have fused the physical, digital, and biological worlds (Schwab, 2017). Together with its enormous positive potentials, digitalisation has also produced critical challenges for all aspects of human society, in terms of dehumanisation, alienation and anomie, social and political instability, fragmentation and polarisation, excessive manipulation, surveillance and repression, deepening inequality and exclusion. Industry 5.0. has been suggested as one of the solutions for the concerning role of humans in the automatic production (Rada, 2015; in Žižek et al., 2021).

In that regard, humans are facing demanding challenges when responding to this novel social condition – and those yet to come. They have to be able to properly respond to the fusion of the virtual and physical reality through enhanced digital literacy, learning, reflexivity and activity. The key concept for understanding the role of individuals in these novel social settings is reflexivity as an internal dialogue mediating between agency and structure (Archer, 2003; 2012). Reflexivity is the intrinsic feature of human psyche enabling individuals to consciously and strategically orient their actions to achieve their goals, having the potential to alter social settings to meet their needs (Archer, 2003).

Archer sees reflexivity as ‘the regular exercise of the mental ability, shared by all normal people, to consider themselves in relation to their (social) contexts and vice versa’ (Archer, 2007, p. 4). Through inner dialogue, they can define their concerns, develop projects, and establish practices. Therefore, based on reflexivity, individuals adopt certain ‘stances’ towards society, which constitute the micro-macro link and produce the ‘active agent’. In that sense, reflexivity is a mediator between structure and agency (Archer, 2003; 2007).

Reflexivity as a process of inner dialogue is also changing through time and differing among individuals. By using a qualitative approach, Archer was able to recognize different modes of reflexivity, which preceded the quantitative tool ICONI, enabling her to determine consistent practitioners of each mode (Archer, 2007; 2012). As Archer says, reflexivity takes place through inner dialogue, which is common to all people, but quite heterogeneous. Based on biographical interviews, she defined four different modes of reflexivity: communicative, autonomous, meta, and fractured (see Archer, 2003; 2007).

All those modes are practised in late modern society; however, there is a certain connection between the modes and social change. Archer (2003; 2007) has, for instance, argued that different periods induce particular modes of reflexivity. In traditional societies, the dominant mode of reflexivity is the communicative one, as it is collectivistic towards the social. Because of social transformations, uncertainties and ‘contextual incongruity’ between new openings and the expectations emanating from individuals’ family backgrounds (Archer, 2012, p.9), one can see communicative reflexivity to be in decline, as young people are compelled to establish their own *modus vivendi*. In recent decades, new unpredictable and uncertain social areas have emerged that have influenced various transitions in everyday life. Modernity enabled autonomous reflexivity, which is accommodative towards social settings. Structural uncertainties have increased the importance of meta-reflexivity, which is transcendental towards the social, and also allow defining a sub-category of fractured reflexivity. Meta-reflexivity is seen as a precondition for responsible behaviour, which leads to specific dynamics of social change enabling morphogenesis of the society to occur.

The consideration of social change to Industry 5.0 goes beyond mechanistic developmental patterns rooted in evolutionism or materialism claiming linearity and irreversibility for social processes (Sztompka, 1993). Instead, the focus is on the contingency of events emphasising human agency, innovativeness and creativeness. The paper explores the micro-level perspective and the concepts of reflexive responsibility and Industry 5.0. in the Slovenian context. By

drawing on the survey on the Slovenian population, we intend to show that when reflexivity refers to a critical consideration towards the social contexts it can cater to more sustainable social practices and society.

2 Methods

Taking into account our previous research (Golob and Makarovič, 2020; 2021) we have constructed and applied a survey questionnaire on a representative national sample of 912 adults in Slovenia. The survey took place from January 19 till February 1, 2022, using a standardised computer aided phone inter-viewing (CATI) method.

The social and the environmental responsibility has been assessed in the survey by a selection of statements that indicate attitudes, intentions, and behaviour (see Table 1). The impact of technology has been assessed by a series of questions on the time spent for social media, video games, using of digital technologies for work and education, for informal learning and following the new, ordering goods and public services on-line. In addition, a classical set of demographic questions on gender, age, educational level, income, and settlement type has been included to measure the ways how individuals are embedded in the social structure.

Table 1: Survey questions on responsibility

	To what extent do you agree with the following statements? (Answer on a scale of 0 to 5, with 0 indicating that this is not true at all and 5 that this is totally true)		How often have you been in the last year ... (0 means never, and 5 means almost each day)
	Attitudes	Intentions	Behaviour
Social responsibility	You feel responsible to help the poor, disabled, sick and other people in need.	You will invest much of your time for voluntary help for the people in need.	You participated in the activities that help people in need?
Environmental responsibility	You feel responsible to protect our natural environment, all animals and plants.	You will invest much of your time to save the planet, the forests and seas.	You participated in the activities that contribute to the protection of natural environment?

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In order to operationalise the concept of reflexivity, we have applied the Reflexivity Measurement Tool (RMT) intended to provide an approximate assessment of one's reflexivity in terms of quantitative scores for different reflexivity modes. Drawing on the Archer's (2003) Internal Conversation Indicator (ICONI) and the work by Porpora and Shumar (2010), RMT includes a series of questions asking: "during the last year, how often did you" (presented more in details in Golob and Makarovič, 2019):

- plan your own future;
- rehearse what you would say in an important conversation;
- imagine the best and worst consequences of a major decision;
- review a conversation that ended badly;
- clarify thoughts about some issue, person or problem (Porpora and Shumar, 2010).

Reflexivity level is thus the sum of the Likert scale responses to these five items calculated by the following formula:

$$R = r_1 + r_2 + r_3 + r_4 + r_5$$

where the values from r_1 to r_5 represent the answers to each of the five items above on the Likert scales, with each of them ranging from zero (never) to four (all the time), and R indicates

the reflexivity level. Reflexivity level R as the sum of the Likert scores ranging from zero (no reflexivity) to 20 (full reflexivity). This should thus be combined with an indication of a certain reflexivity mode: for the purpose of our research, this is personal meta-reflexivity as it indicates a critical way of thinking and acting about oneself and about one's own social environment [23]. Obviously, nobody can be highly meta-reflexive without being highly reflexive: the more the people are reflexive, the more intensive their meta-reflexivity can be. This should be seen as a *multiplier* effect: combining the intensity of internal dialogue (or the reflexivity level R) and the meta-reflexive way of thinking (Golob et al., 2021). Therefore, RMT multiples each person's reflexivity level (R) with her/his Likert scale responses to the question: "During the last year, how often did you carefully consider the key priorities of your life and why you are doing what you are doing?" (L_{met}), ranging again from 0 (never) to 4 (all the time):

$$M_{\text{met}} = R \times L_{\text{met}}$$

The value obtained that way represents the score for the personal meta-reflexivity mode (M_{met}) – ranging from 0 (no meta-reflexivity) to 80 (full meta-reflexivity).

We have applied linear regression models to assess the influence of attitudes to intentions and intentions to behaviour when we dealt with social and environmental responsibility. In these models we have also assessed the significance of meta-reflexivity, technology, and individuals' embeddedness in social structure.

3 Results

Our results confirm a clear relationship between attitudes and intentions in the field of both social and environmental responsibility. Table 2 summarises the factors of responsible intentions that have a significant effect at no more than 10 % level of risk (i.e. with significance levels no higher than 0.10). Standardised (beta) coefficients clearly indicate the attitudes as the most important explanatory factor for the intentions in our model: for the social and for the environmental aspects of responsibility.

The positive effects of meta-reflexivity can clearly be confirmed for environmentally responsible intentions, where they are the second most significant variable in our model. For the socially responsible intentions, on the other hand, this cannot be clearly confirmed as the significance falls slightly beyond a usual threshold for the null-hypotheses rejection.

The effects of digital technology can be statistically confirmed but are rather ambivalent. Extensive use of digital technology for work has a negative impact on socially responsible intentions and playing video games negatively affects environmental responsibility. Buying goods online, on the other hand, is positively related to socially responsible intentions.

The social settings as manifested through some key demographic variables also have some influence. Environmentally responsible intentions are decreasing with age and women are slightly less likely to express them. Socially responsible intentions are slightly more likely in a more sparsely populated areas, i.e., when we move away from heavily urbanised areas. Tertiary education also tends to – somewhat surprisingly – decrease the intensity of responsible intentions both in social and environmental terms. And consistently with that, the same is true for with monthly incomes that exceed 1000 EUR regarding environmentally responsible intentions.

Table 2: Social and environmental responsibility from attitudes to intentions

	Socially responsible intentions			Environmentally responsible intentions		
Variance explained R^2	36.0 %			18.7 %		
	Coeff.	Beta	Sig.	Coeff.	Beta	Sig.
Attitudes	0.657	0.574	0.000	0.527	0.399	0.000
Meta-reflexivity	(0.003)	(0.046)	(0.107)	0.006	0.076	0.018
Digital for work	-0.040	-0.068	0.026			
Buying on-line	0.063	0.078	0.009			
Video games				-0.883	-0.057	0.088
Gender (female)				-0.197	-0.071	0.024
Age				-0.012	-0.139	0.000
Sparsely populated area	0.069	0.059	0.030			
Tertiary education	-0.205	-0.070	0.015	-0.227	-0.075	0.019
Income above 1000 EUR				-0.169	-0.060	0.000
Constant	0.547		0.004	209.437		0.000

In the next step, we consider, how much one's responsible behaviour is affected by her or his intentions – both in social and environmental terms. Consistently with the theory of planned behaviour, just as the attitudes are the most significant predictor of intentions, the latter are the most significant predictor of behaviour – regarding both social and environmental responsibility.

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Meta-reflexivity turns out to be the second most important factor of responsible behaviour – both social and environmental.

The significance of using digital technology for responsible behaviour can only be statistically confirmed for socially responsible behaviour: it is positively related to the use of social media and negatively to the use of digital technologies for informal learning and following the news on-line.

The only demographic variable that can be confirmed as statistically relevant for responsible behaviour is having a monthly income above 1000 EUR – which seems to indicate a slightly negative relationship.

Table 3: Social and environmental responsibility from intentions to behaviour

	Socially responsible behaviour			Environmentally responsible behaviour		
Variance explained R^2	39.5 %			20.9 %		
	Coeff.	Beta	Sig.	Coeff.	Beta	Sig.
Intentions	0.662	0.593	0.000	0.463	0.421	0.000
Meta-reflexivity	0.009	0.103	0.000	0.010	0.124	0.000
Social media	0.114	0.078	0.005			

Technologies for informal leaning	-0.098	-0.066	0.019			
Income above 1000 EUR	-0.143	-0.046	0.085	-0.155	-0.050	0.099
Constant	0.829		0.000	1.431		0.000

4 The findings and conclusions of the paper with thoughts and suggestions for further research

The notion of Industry 5.0 attempts to provide a broader social perspective that may go beyond industry, production, and economy. This is clearly a step in the right direction, but it is questionable if it is sufficiently broad and clear. Human's existence and co-creation of the reality goes far beyond the economy, productive work, and formal organisations. Any serious attempt to picture the contours for a better social order should clearly take this into account.

The current unsustainable social and environmental conditions call for a dramatic change that would establish completely new ways of connecting humans to each other, of connecting them to technology and connecting them to the other living beings and the natural aspects of our planet. While these connections might have been previously anchored in traditional values and norms in pre-industrial society, they have been seriously disrupted by the rapid technological and social change brought forward nowadays. They may be re-established in a new and dynamic way through a new paradigm of responsible and reflexive relations between ourselves and with our planet as a whole. As we have shown with our research, responsibility now demands constant elaboration of social context. Reflexivity therefore plays a crucial role in that regard. Based on our research, we can confirm that reflexive responsibility is an important concept in considering society complying with the demands of Industry 5.0.

Our results have shown that using digital technology as such has ambivalent effects on social and environmental responsibility. The digital skills manifested through on-line shopping seem to be positively related to responsible intentions. Using social media is positively related to socially responsible behaviour. On the other hand, working and learning on-line may alienate individuals from a significant part of their social environment making them less socially responsible. This may also be related to the situation caused by the covid-19 pandemic. Further research is needed to explore how this will be developed in the post-covid world.

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