

IEEE P7010 Well-being Metrics Standard for Autonomous and Intelligent Systems™

An Introduction

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ABSTRACT

IEEE P7010™, *Well-being Metrics Standard for Autonomous and Intelligent Systems™* is a draft standard being developed as part of a suite of projects that were inspired by the IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems.¹ The purpose of the IEEE P7010 draft standard, once approved, is to enable programmers, engineers, technologists and business managers to better consider how the products and services they create can increase human well-being based on a wider spectrum of measures than economic growth and productivity alone. The scope, structure, methodology and current progress of this draft standard are covered in this report.

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1 INTRODUCTION

To date, autonomous and intelligent systems (A/ISs) have been evaluated primarily by their economic impact in the marketplace. However, the marketplace is recognizing that well-being can be a greater measure of value to people than economic indicators. Corporations and governments are realizing that they can contribute positively to the well-being of their customers, communities and the world while maintaining profitability, and that by focusing on well-being, they may become more attractive to their bases. There is, therefore, a need for the identification of metrics that capture the well-being of people in the development, monitoring and understanding of impacts of A/ISs.

The common adage “You can’t manage what you can’t measure” reflects the importance of metrics to manage performance and impacts. Without metrics to measure

the impact on human well-being at both an individual and societal level, innovation for well-being is impossible to quantify or qualify. The IEEE P7010, *Well-being Metrics Standard for Autonomous and Intelligent Systems* enables programmers, engineers, technologists and business managers to better consider how the products and services they create can increase human well-being based on a wider spectrum of measures than economic growth and productivity alone.

This paper presents the scope, structure, methodology and development of the draft IEEE P7010, *Well-being Metrics Standard for Autonomous and Intelligent Systems*. The Standard Working Group for the IEEE P7010 effort, along with the Well-being Committee of The IEEE Global Initiative on Ethics of Autonomous and Intelligent Systems, were created in the belief that A/ISs should prioritize human well-being as an objective in all system designs, using the best available and widely accepted well-being metrics as their reference points.

Reasons a well-being metrics standard is necessary include:

- It provides useful and clear metrics and guidance to engineers, developers, data scientists and others for measuring, monitoring and managing A/IS impacts on human well-being;
- There is a need to proactively ensure that systems are designed in such a way that their outcomes are truly beneficial for humanity; and
- There is a need to proactively mitigate predictable risks at the inception and design phases, and attempt to eliminate reactive afterthought.

Value and Benefits of the Standard Statement

The standard will help designers and developers of autonomous and intelligent systems, business managers of every aspect of the value chain, policy makers, academics and other stakeholders to understand how to develop and measure well-being impacts of autonomous and intelligent systems on humans.

¹ This article solely represents the views of the authors and does not necessarily represent a position of either the IEEE or the IEEE Standards Association.

IEEE *P7010* will provide value to designers, business managers, policy makers, educators and researchers, the public and philosophers. Value will range from managing impacts on human well-being through metrics and a management process to raising awareness, educating the public and stakeholders, and providing a framework for regulations and policy. Full value statements for various sectors will be included in the standard.

Common metrics of success include profit, gross domestic product (GDP), consumption levels, and economic standard of living. While important, these metrics fail to encompass the full spectrum of well-being for individuals or society. Psychological, social, and environmental factors matter. Where these factors are not prioritized as highly as fiscal metrics of success, technologists risk expediting negative and irreversible harms to our planet and population.

Today the societal value of A/ISs is measured largely by their increase of economic production. While issues of job displacement or universal basic income are often discussed, there are diverse and widespread impacts of A/IS on human agency, emotion, physical and mental health, as well as on ecological, governmental and social systems, that warrant consideration. There is a need for well-being metrics to provide guide the development, monitoring and improvement of A/IS to safeguard and increase individual or societal well-being.

This standard will begin to provide unifying, cross-sector clarity for the use of well-being metrics for A/IS creators and other stakeholders. It is hoped that this standard will also spur innovation and contribute to increases in human well-being.

2 SCOPE

This standard establishes well-being metrics relating to human factors affected by autonomous and intelligent systems. It establishes a baseline for the types of objective and subjective data that should be under consideration regarding the impact on human well-being of an A/IS. It identifies metrics for guiding development, analysing impacts on human well-being, and other aspects of programming, functioning, and monitoring autonomous and intelligent systems.

The standard will provide guidance, tools and resources for designers and stakeholders involved in the design and development, or monitoring of, autonomous and intelligent systems.

3 STRUCTURE

There will be six main sections within the standard: (1) executive summary), (2) introduction and benefits of the standard (3) well-being orientation, (4) implementation overview, (5) well-being impact assessment, (6) managerial adaptation and (7) well-being metrics taxonomy and selection compendium

Specifically, it will include:

- Executive Summary;
- Introduction to the standard with conceptual explanation of well-being metrics, plus values statements for the application of the standard by developers and other stakeholders, including business managers, policy makers, educators and researchers, the public and philosophers;
- Orientation to Beyond GDP and well-being with an overview of the application of well-being in various sectors, research findings, and an explanation of well-being in relation to ecological sustainability and human rights;
- A compendium of well-being metrics drawn from well-being and sustainability indices, with a taxonomy and selection process that provides a structure for determining which metrics are relevant to a specific intelligent and/or autonomous system;
- Guidance for implementation, including the logic and theoretical models for the standard, normative and informative references, and terms and glossary;
- A step-by-step process for selecting well-being indicators as part of a well-being impact assessment;
- Managerial adaptation guidance for entities using *P7010* in the business, governmental, educational and non-governmental sectors; and
- Use-Cases and Scenarios section, providing examples and additional guidance for developers, business managers, policy makers, educators and researchers, the public and philosophers.

Defining Well-being

Well-being, for the purposes of IEEE *P7010*, *Well-being Metrics Standard for Autonomous and Intelligent Systems* is defined broadly to encompass positive and negative affect (feelings), flourishing (also called eudaimonia), satisfaction with life and satisfaction with domains of happiness (also called conditions of life), and the state of the domains. Positive affect includes feelings of happiness, joy, contentment, calm, peace, and other positive feelings. Negative affect includes feelings of sadness, stress, anxiety, unhappiness, anger, confusion and other negative feelings. Flourishing includes but is not limited to purpose, meaning, positivity, optimism, worthiness, mastery, self-esteem and other aspects of flourishing. Satisfaction with the domains (also called conditions of life) and the state of the domains can be measured with objective and subjective indicators – the domains are: (1) Affect, (2) Community, (3) Culture, (4) Education, (5) Economy, (6) Environment, (7) Human Settlements, (8) Health, (9) Government, (10) Psychological Well-Being/Mental well-being, (11) Satisfaction with life and (12) Work.

The concept of well-being for IEEE *P7010* encompasses individual psychology, life circumstances, as well as ecological and social systems. The connection between human well-being and ecological health is well-

established. The perspective that human rights represent a floor not a ceiling is a foundational element of the concept of well-being for IEEE *P7010*. The notion that human well-being is inextricably linked to ecological health is also a foundational element of the concept of well-being for IEEE *P7010*. This perspective is aligned with the IEEE Ethically Aligned Design (EAD) Well-being Committee and the section in the EAD whitepaper concerning well-being.

The well-being metrics for IEEE *P7010* expand the domains identified above and are primarily composed of indicators drawn from among the following indices and indicators:

- Cantril's Self Anchoring Ladder
- European Commission's minimum data set of European mental health indicators
- European Social Survey
- Freedom House
- Gallup World Poll
- OECD Guidelines on Measuring Subjective Well-being.
- OECD Better Life Index
- United Nation's Sustainable Development Programme's Sustainable Development Indicators
- U.K. Office for National Statistics Measures of National Well-being
- World Values Survey.
- World Health Organization

4 CURRENT STATUS & HOW TO GET INVOLVED

IEEE *P7010* is being developed by approximately 70 members representing IT professionals, educators and researchers, business management, entrepreneurs, policy makers, communications and the media, and nonprofits. Countries represented include Australia, Canada, China, France, Germany, Hungary, India, Israel, Pakistan, Portugal, South Africa, the United Arab Emirates, the United Kingdom, and the United States of America. To date, the team has compiled a baseline compendium of well-being indicators, and outlined a process for selecting and applying these indicators throughout the A/IS product design lifecycle. Use-case scenarios and management adaptation guidance are currently being developed to provide additional support for organizations considering well-being as part of their ethical A/IS development philosophy. Input from diverse sectors is always welcome. For more information on how to get involved, visit <https://standards.ieee.org/project/7010.html>

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