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Concept report no. 81

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English summary

In project appraisal, it can be crucial to know how long an investment project is expected to last. Lifespan is also important in accounting contexts. In this research study, we examine the economic lifespans and life cycles of digital investment projects in the public sector. Our focus is on economic lifespans, that is, how long the capital in a project remains operational and retains its utility value.

Our first main research question regarding project lifespans is:

- *What lifespans for different types of digital investment projects are assumed and realised in practice?*

For this question, we formulated three sub-questions:

- *Which lifespans are considered realistic in reports and by experts in the field?*
- *What does research literature and guidance material indicate about lifespans?*
- *Which assumptions about lifespans follow from macroeconomic statistics and accounting rules?*

Our second main research question concerning project life cycles is:

- *How do the life cycles of digital investment projects unfold?*

For this question, we formulated five sub-questions:

- *How do lifespans change over time?*
- *How does the capital stock depreciate over time?*
- *What role do reinvestments and various internal and external influencing factors play?*
- *What is the relationship between lifespan issues and the likelihood of failed projects?*
- *How do lifespans of public-sector digital investment projects differ from each other and from other investment projects?*

Because mapping the lifespans of digital investment projects in the public sector is far from straightforward, we emphasise methodological triangulation, followed by principled and empirical analyses. Our data and methodological triangulation include research and policy literature, guidance documents, expert assessments through interviews, macroeconomic statistics, and accounting regulations.

A digital investment project can be defined as a time-limited initiative in which one or more actors contribute capital, products, and expertise to develop, acquire, adapt, or implement information and communication technology solutions, with the goal of achieving lasting benefits in the form of efficiency gains, improved or new services, and shared infrastructure solutions. We distinguish between digitalisation projects and digital infrastructure projects, as this distinction is relevant for lifespan considerations. Digital infrastructure projects can be divided into networks and hardware systems, while digitalisation projects typically include a software component and an organisational component. They may enhance internal work processes or customer-facing services. Our mapping shows that digitalisation projects are more widespread than digital infrastructure projects.

Compared with other investment projects, digital investment projects face relatively rapid technological development and often involve innovation, which increases uncertainty regarding project lifespans. The impact of technology on lifespans applies particularly to digitalisation projects. Digitalisation projects typically have shorter and more variable lifespans than other investment projects.

In this research study, we conduct six assessments of digital investment project lifespans, covering both project components and the projects as a whole. These assessments illuminate relevant lifespans and can serve as reference assumptions in evaluations of digital investment projects. They include:

- **Ongoing and planned projects:** Observed lifespans so far are 12.1 years for 21 digitalisation projects and 17.5 years for 22 digital infrastructure projects. According to project documents, planned lifespans are 15.0 years for 21 digitalisation projects and 17.4 years for 10 digital infrastructure projects.
- **Expert assessments:** Based on interviews with 30 informants, expected lifespans for digitalisation projects are 10 to 15 years

normally and 5 to 20 years in special cases, and 15 to 30 years normally and 10 to 40 years in special cases for digital infrastructure projects.

- **Research literature:** Mainly used for national accounts and other accounting purposes, suggesting that components within digitalisation projects typically have lifespans under ten years (software, data equipment), whereas digital infrastructure investments include components lasting up to 40 years (telecom infrastructure), with a concentration around 15 years.
- **Macroeconomic statistics:** National accounts imply lifespans under 5 years for IT equipment and for software and databases, and 10 to 20 years for telecommunications equipment and infrastructure.
- **Accounting regulations:** For agencies' and enterprises' annual and tax accounts, lifespans are 3 to 5 years for software, 4 to 7 years for IT equipment, 5 to 10 years for telecommunications equipment, and 20 to 50 years for supporting infrastructure.
- **Guidance documents:** National and international guidance indicates that the user-facing part of digital investment projects has a shorter lifespan than the underlying infrastructure. The Norwegian Agency for Public and Financial Management (Direktoratet for forvaltning og økonomistyring 2023) and the Norwegian Digitalisation Agency (Digitaliseringsdirektoratet (2022) recommend 5 to 15 years and 15 to 20 years, respectively, for digitalisation projects. Guidance from the Norwegian Coastal Administration (Kystverket 2021), the Norwegian Railway Directorate (Jernbanedirektoratet 2024), and the Norwegian Water Resources and Energy Directorate (Norges vassdrags- og energidirektorat 2025) provides examples of digital infrastructure with lifespans of 20 to 50 years.

All referenced lifespans are measured from the start of the operational period. Unlike conventional infrastructure projects, where the investment phase is usually completed before operations begin, many digital investment projects are deployed during the first investment phase, particularly digitalisation projects. Different sources apply different assumptions regarding the starting point of the lifespan, so the figures are not necessarily directly comparable.

National accounts and research literature suggest that the lifespans of several ICT components have slightly declined over time. Most informants' assessments align with this trend. For digitalisation projects, this is attributed to faster technological change, increased market and regulatory requirements, and the shift from siloed thinking to more dynamic, modular solutions. For digital infrastructure projects, rapid technological development, stricter security requirements, and the need for new functionality shorten lifespans, while quality improvements, more robust and energy-efficient components, standardisation, and international harmonisation extend lifespans.

Depreciation paths – how the capital stock declines over time – are also crucial for project assessments. The OECD and the EU recommend geometric depreciation for capital cohorts, while Statistics Norway finds that linear depreciation is considered most realistic for ICT-related capital in Norwegian businesses. Among our informants, only 29 per cent consider these conventional depreciation paths most realistic for digitalisation projects, versus 50 per cent for digital infrastructure projects. Logistic depreciation, where capital initially depreciates slowly, then rapidly, and finally slowly again (forming an inverted S-shape), receives significant support: 33 per cent for digitalisation projects and 23 per cent for digital infrastructure projects.

Reinvestments can improve quality over a given lifespan and extend it, while project managers may also terminate projects that are still technically viable. The project's optimal lifespan is the one that maximises net present value. For digital solutions, modularisation, cloud services, and service-based models increase flexibility, though new requirements and technological change may necessitate larger replacements. For infrastructure, a robust initial design combined with maintenance is key to optimising lifespan, while active equipment is more affected by market-driven replacement.

Variations in lifespans are not only due to project design but also internal and external factors. For digitalisation projects, informants consider regulatory requirements the most important factor, followed by system flexibility, technological obsolescence, and information management/security. Lifespans of digital infrastructure projects are assessed as less sensitive, with no single factor standing out as more important than others.

Some digital investment projects generate negative net benefits, meaning that the realised benefits are lower than costs after discounting. Among these, some projects fail entirely, with little or no use. Informants estimate the probability of negative net benefits for digitalisation projects at 30 to 60 per cent, and the probability of project failure at 10 to 25 per cent, compared with 10 to 20 per cent in the literature. For digital infrastructure projects, both failure and negative net benefits are negligible. In most cases of failed infrastructure projects we encountered, lack of market demand was a key factor, with technological challenges as an additional cause. These probabilities should be considered best estimates rather than precise figures.

The literature emphasises complexity and size as risk factors for digitalisation project failure, while success factors include technical and organisational flexibility and project setup. Our informants highlighted factors influencing project failure: organisational flexibility, system flexibility, regulatory requirements, new technology and user needs, clear and realistic project planning, competence, implementation capacity, and supplier dependency.

Based on our findings regarding economic lifespans of digital investment projects, we recommend the following for improving evaluation practices:

- **Starting point for lifespans:** Lifespans should be calculated from when projects are ready for use in production or consumption, usually beginning during the first phase of each project's investment period.
- **Two-peaked distribution:** The significant probability that some digital investment projects fail means that lifespan follows a conceptual two-peaked distribution. The first peak is around zero years, while the rest of the distribution approximates a bell curve, with the second peak several years out. The ex-ante expected lifespan accounts for potential failure and is shorter than the peak of the bell curve.
- **Expected lifespan for digitalisation projects:** We recommend 10 to 20 years under normal circumstances. The specific value (e.g., 10, 15, or 20 years) depends on available information. Projects with large investments, reinvestment programs, agile development, and a cautious start, combined with delayed benefit realisation, tend to have longer lifespans. Leased projects should be assigned a lifespan equal to the lease period. If specific information, such as supplier guarantees or milestone upgrades, is available, it should be used, even if it implies a lifespan outside the 10-to-20-year range. In the absence of such information, we recommend 15 years.
- **Expected lifespan for digital infrastructure projects:** We recommend 15 to 40 years under normal circumstances. Longer-lived projects and components should be considered if information is

available. In the absence of such information, we recommend 20 years.

- **Component reference values:** For socio-economic analyses, standardised assumptions for component lifespans help ensure comparability across evaluations, while also considering project heterogeneity. We provide reference values for relevant components.
- **Uncertainty analyses:** Due to uncertainty and variation in lifespans, we recommend that analyses consider whether uncertainty assessments should play a larger role in the State Project Model, with separate steps for projects at risk of failure and realised project lifespans.

Future research needs to include:

- **Managing the investment-to-operations transition:** Explore how the State Project Model could facilitate more continuous and flexible funding and whether this is feasible, balancing predictability for managers with cost-control requirements.
- **Optimising lifespans and reinvestments:** More research on optimal lifespans, reinvestment timing, and termination is needed, including reasons for deviations between actual and optimal lifespans, and the timing of realistic replacements.

Influence of determinants on lifespan and project failure: Research is needed on factors affecting lifespans and project failure probabilities, and interventions to support successful projects and extend lifespans.

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Forskningsprogrammet Concept skal utvikle kunnskap som sikrer bedre ressursutnytting og effekt av store, statlige investeringer. Programmet driver følgeforskning knyttet til de største statlige investeringsprosjektene over en rekke år. En skal trekke erfaringer fra disse som kan bedre utformingen og kvalitetssikringen av nye investeringsprosjekter før de settes i gang.

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The Concept research program aims to develop know-how to help make more efficient use of resources and improve the effect of major public investments. The Program is designed to follow up on the largest public projects over a period of several years, and help improve design and quality assurance of future public projects before they are formally approved.

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