

# Service design for solutions to the United Nations Sustainable Development Goals.

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**Abstract.** While large organisations use technology and innovation to automate processes that reduce employment, startup companies can create employment. While there is little data about survival rates and reasons for failure, a lack of process and decisions based on assertion and assumption may be important factors. Only a small number of startups survive for more than twelve months and so their potential for social, economic and environmental impact is limited.

To increase the rate of startup survival and so increase associated employment, as well as other positive impacts, this paper describes a systemic process for startups to use to assess their progress, in which decision quality is based on evidence at frequent check points. To do this a confidence score is assigned to the evidence and a vector created through the decision check points to indicate the rate of value creation with a trend for defined objectives. Based on this evidence, progress can be assessed objectively.

## 1 A programme for developing solutions for the SDGs: UNLEASH.

Founded in 2018, UNLEASH [1] has the mission to connect and engage 1,000 young people annually to develop innovative solutions addressing the United Nations Sustainable Development Goals (SDGs). To date (May 2023) the initiative has engaged 7,000 young people from 167 countries and developed more than 1,000 solutions for the SDGs.

An example of an UNLEASH solution for SDG 2: zero hunger and SDG 8: economic growth is Ecotutu [2], who are developing ways of extending the life of fresh produce with multi-channel, cold chain services. It is an “off-grid” cooling solution for agricultural businesses: solar-powered cool storage with remote monitoring. In the twenty months since startup, they have:

- Serviced 74 businesses
- Created \$91,000 in revenue
- Set up 3 operational hubs in power-deficit communities
- Reached 700+ smallholder farmers

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**Figure 1.** Ecotutu solar powered cool storage



The results in terms of impact are:

- 12,463 tons of fruits and vegetables saved from spoilage
- More than 800,000 metric tons of greenhouse gas emission saved
- 726 farmers and retailers have increased their income by nearly 30%.

The challenge is that 42% of startups fail in the first year.[3] There is a great shortage of reliable data about the survival rate of startups and investment in start ups,. Reasons for the low survival rate include:

- Lack of competence in project management.
- Focus on doing what they can, rather than what they should.
- Focus on cost, rather than value.
- Too much time spent chasing funding.
- Little understand of what competences are needed.
- Decisions made on assertion and assumption.
- Challenge of allocating resources effectively.
- Few if any measures of social, economic or environmental impact.
- Lots of activity, but little process.

Solutions are often selected on the basis of subjective assessments that tend to be political and emotional, since there is little or no objective data. Possibly the most important reason for failure is poor decision quality, with decisions – including those of investors in startups – based on assertions and untested assumptions, rather than evidence.

Commoditization and price competition require large organisations to replace people with technology. One result is that there are 2.55 million young people aged 18-24 unemployed in the EU27.[4] Nearly 1 in 3 youth cannot find jobs in the Middle East & North Africa. [5] Startups are one of the few means to create employment. It is estimated that 63,000 startups each employing four people would be needed to increase youth employment by 10%.<sup>†</sup>

Increasing the survival rate requires a highly scalable, easy to use decision process. A well-decision designed process can support repeatability, scalability and reduce risks.

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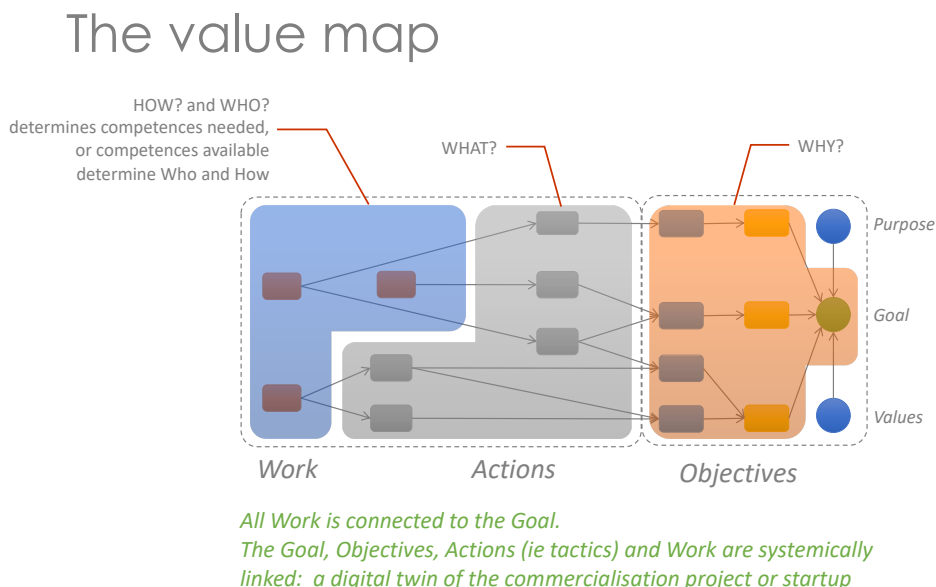
<sup>†</sup> Coutts estimate August 2022.

Design of the process as a service for users ensures that the user finds it easy and simple to use; to setup, develop and objectively assess the progress of their startup applying the process, methods and tools as part of learning while doing: a form of action learning.

## 2 The Value Map

The service designed to increase the survival rate of startups is based on a value map that is used to link all the startup activity into a systemic process with decisions based on evidence.

**Figure 2.** Value Map Schematic



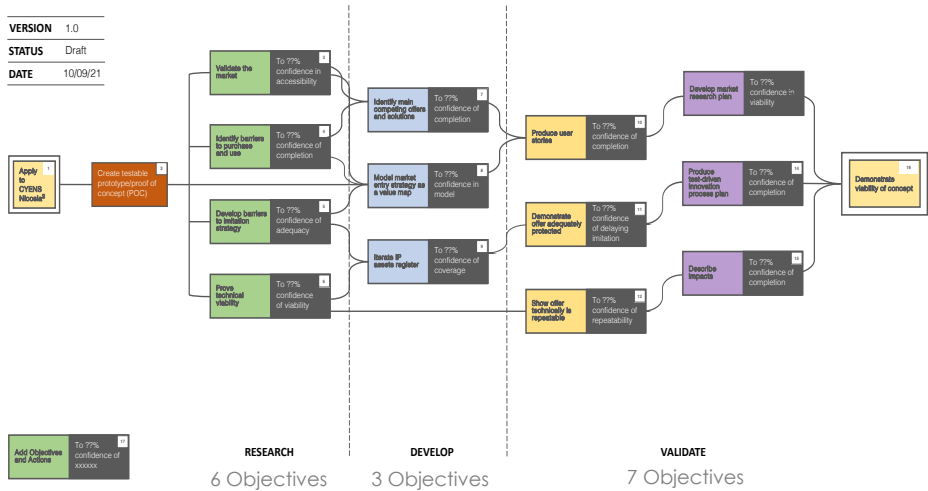
The Goal, which is governed by the purpose and values of the startup team is reached when all the Objectives - the Why – have been achieved. The Objectives are achieved when all the Actions needed for each Objective are completed - for example the development of a viable service for testing with use. – is the “What.” Work is needed to complete each Action, and this is the How and Who - i.e. the competence needed to carry out the work. The role of competence is critical: if the right competence, is not available at the right time, risks which may cause the team to fail to reach one or more of their Objectives and hence the Goal.

Startups can be in different stages of development, from ideation – the development of potential solutions to the problem; to innovation – specification of solutions for testing; then incubation – developing and testing the prototype of the solutions and then acceleration: developing the business model and acquiring customers. The value map is a simple type of directed graph and sets out the logic: “If I do this, then I am confident I will get this value.

The startup team can use or adapt one of the predefined Value Maps or co-create a new map to meet specific goals and other types of project, such as the development of an intellectual property strategy, a market entry strategy or the commercialization of an academic research project.

Below is an example of a value map used for the ideation stage of a startup.

Figure 3. Value Map for the Ideation Stage.



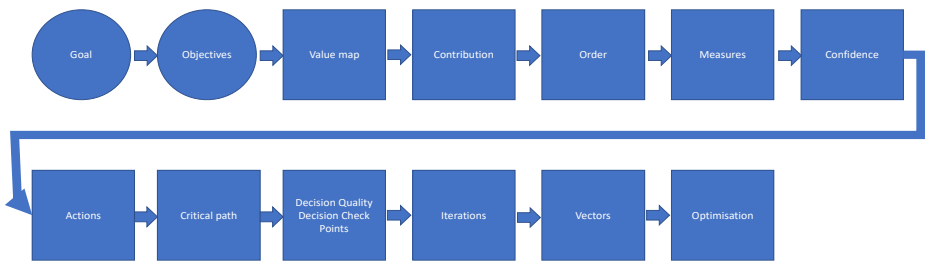
Confidence is proven to be a strong indicator of probably outcome, so a target level of confidence is set for each Objective and the level of confidence is based on the evidence that the Objective can be achieved. [6]

Figure 4. Example Goals and Objectives



The process to complete the Objectives in the value map, from the contribution to value to the Goal of each Objective, through to the optimisation of the allocation of resources: time, money and competence is shown below:

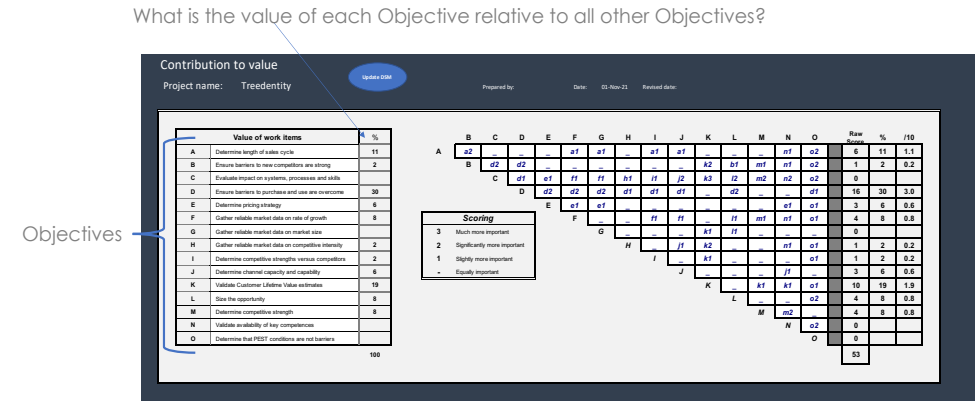
Figure 5. Schematic of the process



### 3 Value of each Objective

The startup team uses the paired comparison method to assess the contribution to value of each Objective relative to all other Objectives.

**Figure 6.** Paired comparison of the relative value of the Objectives.



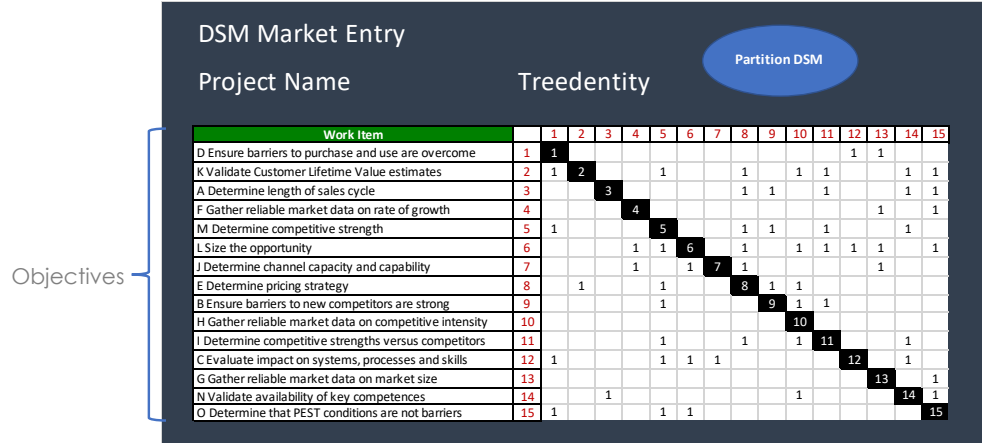
This is important as it helps the startup team avoid spending too much time doing the things they like or prefer doing and not enough time on the work they do not like doing, do not understand or do not have the competence needed. The relative value helps to ensures that time and budget is allocated according to the value of the Objective.

### 4 Order of Objectives – the Design Structure Matrix

The Design Structure Matrix (DSM) is a simple way of identifying the dependencies, which mainly relate to information, i.e. the information from one Objective is needed to make decisions about or to complete another Objective. By minimising dependencies, project risks can be reduced; iterations can be planned, and time to completion can often be reduced just by completing the Objectives in the most effective order. This simple technique, the Design Structure Matrix (DSM), makes it easy to find the dependencies.

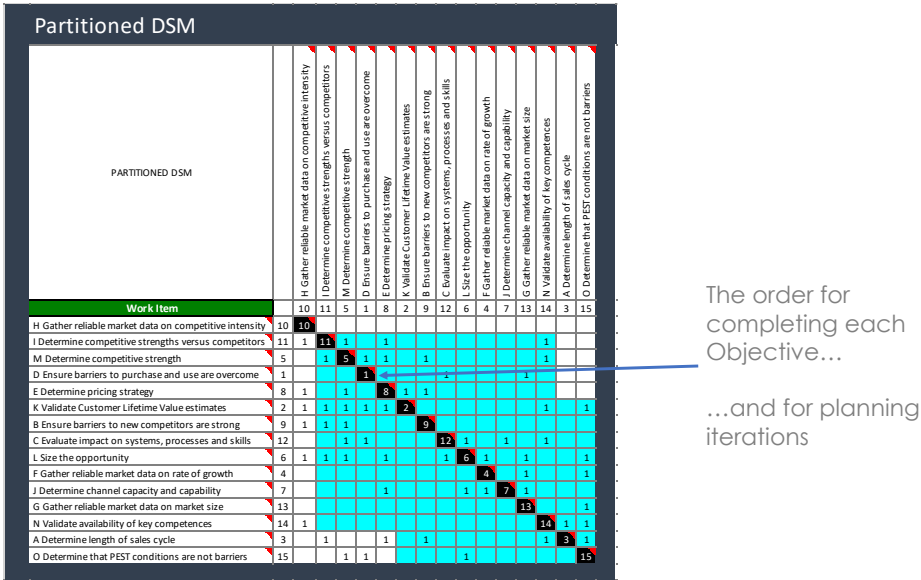
Once the contribution to value of each Objective is determined, the most efficient order to start each Objective can be found using the DSM. The Objectives (named as tasks in figure 7 below) are listed horizontally and then the same Objectives are listed vertically. A question is asked for each Objective: “In order to start this Objective, does any other Objective need to be completed first?”. By finding the dependencies, it is then possible to minimise dependencies, which usually improves the flexibility or plasticity of the project, which is in turn likely to reduce risks.

Figure 7. Design Structure Matrix



The changes needed to minimise any iterations, when tasks require several cycles to be completed can be decided.

Figure 8. Partitioned DSM



The DSM macro [7] then sorts the Objectives into the most logical order and shows any dependencies (in the blue squares above the partition, the diagonal of black cells) that will require iterations. Replanning of the Objectives may remove the need for iterations which increase time and cost to completion.

An alternative method of finding the dependencies is to use critical path analysis (CPA) and the PERT method, which has the advantage of showing the earliest and latest start times for each Objective and the critical path – the shortest time in which all the Objectives can be completed, i.e. the time needed to complete the project. The CPA tool can be used to assess the impact of changes to resources on the value and time for the Objectives and the Goal.

With these data, the allocation of time, cost, competence and other resources can be optimized and alternative scenarios assessed and resources reallocated – for example, when the startup team decides to pivot, i.e. change the Goal or one or more Objective.

Resource allocation can be optimized to maximise value for a given constraint or minimize time to value. Different scenarios can be assessed quickly, and risk is reduced, as the value map is more robust the faster the team can switch scenarios and resource allocation.

5 Confidence

The target level of confidence needed in each Objective in order to commit resources (usually time, money and competence) is set. The guiding rule is that the higher the contribution to value of the Objective, the more resource it may require and hence a higher level of confidence in the commitment of that resource. Also, the bigger impact on the Goal if some or all of the value of the Objective is not created.

Figure 9. Confidence table



A confidence table is used as the reference for the level of confidence in the evidence– the Gollier paper shows that the level of uncertainty is a good predictor of the probable outcome. [8] The definition for each level should be adapted or changed according to the characteristics of your project. For a simple, low risk project you may use perhaps only three or four confidence levels: eg 25%, 50%, 75%, 90%. The confidence level applied should relate to the quality of the evidence available - independent, third-party evidence being preferable. Few projects achieve 100% - so 100% confidence is not used.

The source and date of each definition should be recorded and the source and date of evidence supporting assignment of a confidence level should also be recorded.

Confidence levels are assigned to all important estimates in the project, i.e. those involving large amounts of time and cost It is important to have the right people involved in defining and assigning confidence levels, i.e. the individuals internally and externally who have relevant experience and competence. Users can then consider what can be done when an estimate has a high allocation of resource (either or both money and time) and a low confidence level:

- the quality of information needed to raise confidence,
- the time needed to get that information and
- the cost of getting the information.

The most important aspect is to agree what level of confidence is needed before resources can be committed to an option, so that it may become an action. Estimates may be of revenue, costs, time required, target dates, e.g. milestone dates and other factors. As uncertainty is proven to be the best predictor of outcomes, the measures of confidence show the degree of uncertainty in the goal system.

6 Measures of performance for each Objective.

Once the measures of performance for each Objective have been agreed, progress in creating the value of each Objective can be measured.

Figure 10. Measures

How the performance of each Objective will be measured.

Target, Acceptable and Fail levels of confidence for each Objective.

| Objective                                      | Contribution to value % | Measure                                                                | Confidence in what?                                          | Fail % | Acceptable % | Target % |
|------------------------------------------------|-------------------------|------------------------------------------------------------------------|--------------------------------------------------------------|--------|--------------|----------|
| V Verify core user needs                       | 9.3%                    | Number of users with positive confirmation of needs.                   | Validity of confirmation.                                    | 60%    | 75%          | 90%      |
| E Identify key customer tasks and features     | 5.0%                    | Number of potential users whose needs and features have been assessed. | Confidence that all tasks and features have been identified. | 70%    | 80%          | 95%      |
| A Identify top 3 potential markets             | 3.7%                    | Score used to evaluate a potential market                              | Confidence in total score of evaluation criteria.            | 50%    | 65%          | 80%      |
| M Assess competitive strength of offer         | 3.2%                    | Score relative to competitors                                          | Confidence in validity of the score                          | 40%    | 60%          | 80%      |
| J Draft and validate customer value hypothesis | 6.3%                    | Number of positive response from potential users                       | Confidence in positive responses to proposition              | 60%    | 75%          | 90%      |

Objective: Verify core user needs

Measure: Number of users with positive confirmation of needs

Target = 25 positive responses

Confidence in what: Validity of confirmation.

Fail <60% confidence, i.e. 60% of 25 users, i.e. 15 users with positive confirmation

For each Objective, a scale of measure can be agreed and metrics set for Fail, Acceptable and Target performance. [9] For example, to measure the Objective from the value map of “Verify core user needs”, the number of users with positive confirmation of their needs are going to be measured, with a Target of 25 positive responses. Fail would be 60% or less than 25 positive responses.

Note: the measure based is on evidence that can be verified and then the action can be repeated to get more evidence, or alternative ways or actions found to get more evidence to increase the level of confidence.



## 7 Actions needed to reach the Objectives.

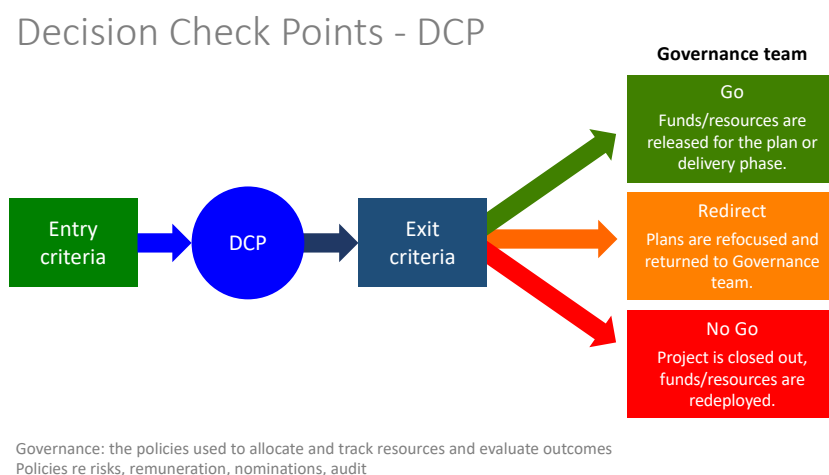
To create the value of the Objective, a number of Actions, which are real options, with different potential cost, time and value can be taken. The Actions can be managed using a method of project management such as kanban, with a kanban card for each Objective and the Actions that will taken to create value. Once all the Actions have been decided with start and finish dates and duration, a critical path network can be developed that shows the least time to reach the Goal.

## 8 Decision quality and decision check points (DCPs)

Decision quality is assessed at a series of decision check points to check the quality of evidence. [10] The decision quality check (DCQ) questions are:

- 1 Have we focused on value?
- 2 Have we framed the right problem?
- 3 Have we understood the problem?
- 4 Have we found creative, feasible alternatives?
- 5 Have we used expert assessments?
- 6 Have we gathered meaningful, reliable information?
- 7 Have we established clear values and trade-offs?
- 8 Have we avoided “analysis paralysis”?
- 9 Have we used logical thinking?
- 10 Do we have commitment to action?

**Figure 11.** Decision Check Points

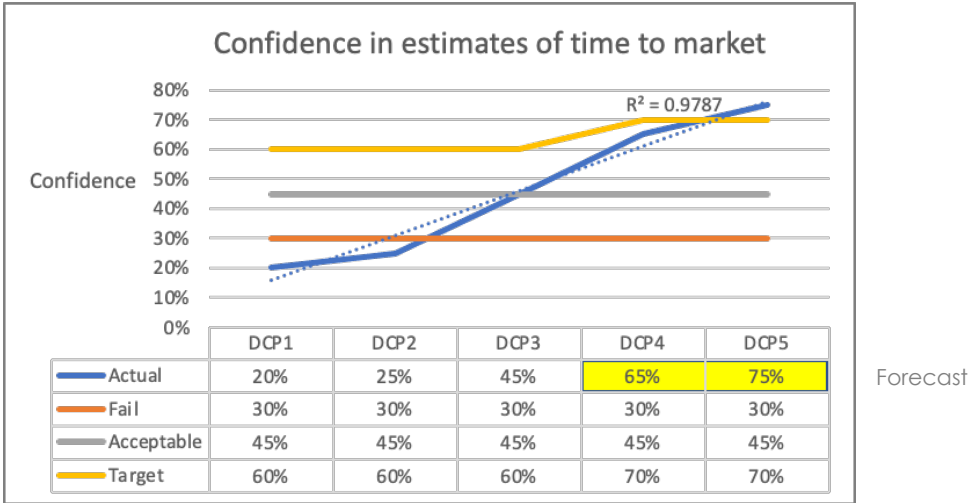


The iterations that may be necessary to increase the quality of evidence above our Fail metric, to Acceptable and then Target performance can then be reviewed. There is a number of iterations at which the evidence is reviewed and the level of confidence to achieved in the next cycle is agreed. The shorter the cycle between decision check points, the less work in progress (time and money) is at risk of a new piece of information affecting the option value of the Action.[11]

9 Vectors of value created

A vector can be created from the changes in confidence at each DCP for each Objective.

Figure 12 Vector of value created



Progress can then be reviewed in terms of value created, by Objective and for all their Objectives in the project with a forecast of value using a probability coefficient ( $r^2$ ).

10 Summary

How well the service for startup survival is designed will determine the use and the social, economic and environmental impact the startup can have on the UN SDGs and hence the return on the assets used to provide the service.

11 Concluding remarks

The workflow and tools have been designed to be simple to use and easily implemented by investment managers, managers of incubation and acceleration programmes as well as startup teams. Further work, based on user feedback and continual improvement, is needed to make the use of the tools and the workflow as simple as possible, since simplicity is likely to reduce the barriers to adoption and continued use.

Most of the tools are simple frameworks for the data on which the level of confidence is calibrated. The frameworks make organising, sharing and updating the data efficient and effective.

For users with limited or no internet access, the tools can be used in paper format, following the instructions and guides provided with the tools, together with links to experts in the subject of each tool. The completed documents can then be scanned and sent by post or electronically for review.

The tools are explained in workshops, both online and in person and then applied by the startups to their projects, with support from an expert.

Users are invited to present their use of the tool for discussion with the group – the number of users presenting depending on the time available.

The questions and answers during the discussion help consolidate the understanding of each subject, how to use the tool and its application. This is discussion teaching, a form of action learning, as the users make suggestions and ask questions: “Every student teaches and every teacher learns” [12]. The startup teams learn from each other more readily than from the expert, who often does not have the language of the team as their first language.

Adoption and use of the tools, with decisions based on the quality of evidence, is expected to increase the survival rate of the startup. While it is not possible at present to isolate the contribution of the tools to the rate of survival, two programmes where the tools have been applied have achieved higher than average survival rates. The Design London Incubator [13] - an incubator for student projects has a survival rate of more than 50%, with six out of a cohort of eleven projects still active over a period of twelve years. The ETICoop programme has incubated more than 200 projects since the programme started in 2013, with a survival rate of each project of more than 80% over a period of three years from the start of the project [14].

*The value of your assets depends on how well you design the services  
that use those assets.*

## References

1. <https://unleash.org> sourced 5 June 2023.
2. <https://ecotutu.com/> sourced 5 June 2023.
3. <https://medium.com/glassdollar/estimating-the-number-of-startups-in-europe-5d28286307f8> sourced 5 June 2023.
4. [https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Unemployment\\_statistics#Youth\\_unemployment](https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Unemployment_statistics#Youth_unemployment) sourced June 2022.
5. EFE: Nearly 1 in 3 youth cannot find jobs in the Middle East & North Africa source: <https://efe.org/> sourced 5 June 2023.
6. C. Gollier, *Expected net present value, expected net future value, and the Ramsey rule*, Toulouse School of Economics Working Paper Series, **09-049** (2009) .
7. <https://dsmweb.org/excel-macros-for-partitioning-and-simulation/> sourced 5 June 2023.
8. T. Gilb, *Competitive Engineering*, 274, Butterworth-Heinemann (2006).
9. T. Gilb, *Competitive Engineering*, 139, Butterworth-Heinemann (2006).
10. D. C. Skinner, *Introduction to Decision Analysis*, Probabilistic Publishing, 3<sup>rd</sup> ed., 326, (2009).
11. M. Amram, N. Kulatilaka, *Real Options*, 10, Harvard Business School Press, (1999)
12. C. R. Christensen, David A. Garvin, and A. Sweet, eds. *Education for Judgment: The Artistry of Discussion Leadership*. Boston: Harvard Business School Press, 1991.
13. A partnership between Imperial College London and the Royal College of Art; subsumed by Innovation RCA: <https://www.rca.ac.uk/business/innovationrca/> sourced 6 July 2023.
14. ETICoop: <https://www.facebook.com/ETICoopasso/> sourced 6 July 2023.