



## EDUCAÇÃO EMPREENDEDORA NAS ESCOLAS DE ENGENHARIA: UMA REVISÃO SISTEMÁTICA DA LITERATURA

Bruno Campana

Dissertação de Mestrado apresentada ao Programa de Pós-graduação em Engenharia de Produção, COPPE, da Universidade Federal do Rio de Janeiro, como parte dos requisitos necessários à obtenção do título de Mestre em Engenharia de Produção.

Orientador: Édison Renato Pereira da Silva

Rio de Janeiro  
Março de 2022

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LUIZ COIMBRA DE PÓS-GRADUAÇÃO E PESQUISA DE ENGENHARIA  
DA UNIVERSIDADE FEDERAL DO RIO DE JANEIRO COMO PARTE DOS  
REQUISITOS NECESSÁRIOS PARA A OBTENÇÃO DO GRAU DE MESTRE EM  
CIÊNCIAS EM ENGENHARIA DE PRODUÇÃO.

Orientador: Édison Renato Pereira da Silva

Aprovada por: Prof. Édison Renato Pereira da Silva  
Prof. Domício Proença Júnior

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Referências Bibliográficas: p. 21 – 21.

1. engineering education. 2. entrepreneurial education. 3. entrepreneurial engineering. 4. Primeira palavra-chave. 5. Segunda palavra-chave. 6. Terceira palavra-chave. I. Silva, Édison Renato Pereira da. II. Universidade Federal do Rio de Janeiro, COPPE, Programa de Engenharia de Produção. III. Título.

*Dedicado à minha linda esposa.*

# Agradecimentos

Gostaria de agradecer a todos.

Resumo da Dissertação apresentada à COPPE/UFRJ como parte dos requisitos necessários para a obtenção do grau de Mestre em Ciências (M.Sc.)

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Março/2022

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Programa: Engenharia de Produção

But, this brings us back to a relevant question: "Okay. I believe in the potential of the cryptocurrency ecosystem." But why specifically believe in Bitcoin's potential? There are better technologies coming out there, such as Hathor, Polkadot and Cardano. This is a crucial point for building our understanding. The main creator of Ethereum, which is now undergoing a migration from the Proof of Work protocol to the Proof of Stake, rightly cited the fact that Bitcoin was not adapting and changing and evolving so fast, as if saying it was falling behind. And what Vitalik (creator of Ethereum) puts as a deficiency, a problem, I see as something positive. Here is the reasoning in which I explain the reason.

It's undeniable that Bitcoin has many shortcomings, however note, it doesn't need to evolve to address all of these shortcomings. The entire cryptocurrency ecosystem exists for just that. Despite the fact that change, evolution is relevant for a variety of reasons, Bitcoin's non-change doesn't just have a downside. There is also a non-change positive side. The ecosystem MUST evolve, but it also needs a solid foundation, and that requires perpetuity. And that implies slower changes, or perhaps almost non-changes.

Of course, small changes, especially related to security, are relevant. But radical changes, such as block size, speed, protocol, etc. All this generates excessive dynamism. Better to leave such dynamism to other cryptocurrencies. Bitcoin was the first crypto to be created. For 10 years without operating failures, your network is synonymous with robustness. With 10 years of existence, there has been time for its source code to be seen and reviewed by scientists and engineers. There was already time for bugs to be fixed. There was time for people to digest and understand the advantages, disadvantages and limitations. There's already been enough time and enough hype to create enough marketing and make Bitcoin known enough.

This all brings confidence. And that trust produces the value Bitcoin has. The entire existing ecosystem has already been built, intertwining in some way with the existence of Bitcoin. All this has value. Therefore, Bitcoin is the symbol representing the market to which it belongs. In that sense, an analogy with Swiss banks is reasonable. Swiss banks now charge negative interest to their large customers. Without a doubt, there are countries with more favorable legislation, positive interest rates, and several other attractions to attract large customers. And in effect, they will be able to capture customers. But still, there are a number of clients willing to leave their capital in Swiss banks even at negative interest. Yes, interest rates are the worst in the world, yes the legislation is not as favorable as possible, but... it's Switzerland. I trust Switzerland. They've been doing this for decades. It's stable. It's safe. It's trustable. I know it will go in year, it will go out year, and they won't suddenly change the legislation. I trust that no change in the political landscape will put my capital at risk.

And so is Bitcoin for the cryptocurrency market. He doesn't need to, more than that, he **MUST NOT CHANGE**. The ecosystem needs to evolve, but it needs to stay as it is. What's more: Bitcoin is just the ideal crypto for "non-change", because the technology's inventor, known by the pseudonym Satoshi Nakamoto is anonymous, and there is no organization strong enough to "dict the course of the token", as the case of other projects.

Abstract of Dissertation presented to COPPE/UFRJ as a partial fulfillment of the requirements for the degree of Master of Science (M.Sc.)

## ENTREPRENEURIAL EDUCATION AT ENGINEERING SCHOOLS: A SYSTEMATIC LITERATURE REVIEW

Bruno Campana

March/2022

Advisor: Édison Renato Pereira da Silva

Department: Production Engineering

And taking advantage of the quote from Satoshi Nakamoto, there are also those who say: "Bitcoin was not supposed to be like that. This is not what Satoshi Nakamoto conceived". Note, I don't know what exactly the individual or group behind the Bitcoin invention conceived. But you see, every human invention encapsulates the knowledge and knowhow of its creator. Encapsulate your ideas. But after "free in the world", invention has a "life of its own", and the ecosystem that was created from the invention has a life of its own. For good and for bad. There is not much more to be said for this.

We are near the end of the opinions I would like to express. One of the last concerns the opinions of politicians, investors, bankers and researchers about the future potential for cryptocurrencies. As I've already expressed, I see no reason to treat cryptocurrencies as an innovation unlike any other technological advance seen in humanity. And so, I am optimistic about the potential of cryptocurrencies, but realistic, far from the detachment from reality of some "moon boys". Now, one of the nuisances driving the perceived value of cryptocurrencies up is good news coming from these industries, which is fair, because it implies progress in adoption. On the other hand, there is the impact of bad news also coming from politicians, investors, bankers and researchers. And it is on this news that I want to do one of our latest mental exercises.



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# Lista de Símbolos

$\emptyset$	Conjunto vazio, p. 1
$\mathbb{R}$	Conjunto dos números reais, p. 1

# Lista de Abreviaturas

COPPE	Instituto Alberto Luiz Coimbra de Pós-graduação e Pesquisa de Engenharia, p. 1
RSL	Revisão Sistemática da Literatura, p. 1







Gráfico 1.1: Um gráfico de exemplo



# Capítulo 2

## Revisão Bibliográfica

Para ilustrar a completa adesão ao estilo de citações e listagem de referências bibliográficas, a Tabela 2.1 apresenta citações de alguns dos trabalhos contidos na norma fornecida pela CPGP da COPPE, utilizando o estilo numérico.

Tabela 2.1: Exemplos de citações utilizando o comando padrão `\cite` do  $\text{\LaTeX}$  e o comando `\citet`, fornecido pelo pacote `natbib`.

Tipo da Publicação	<code>\cite</code>	<code>\citet</code>
Livro	[2]	ABRAHAM <i>et al.</i> [2]
Artigo	[1]	IESAN [1]
Relatório	[3]	MAESTRELLO [3]
Relatório	[4]	GARRET [4]
Anais de Congresso	[5]	GURTIN [5]
Séries	[6]	COWIN [6]
Em Livro	[7]	EDWARDS [7]
Dissertação de mestrado	[8]	TUNTOMO [8]
Tese de doutorado	[9]	PAES JUNIOR [9]

# Capítulo 3

## Design da Pesquisa

### 3.1 Nível 2

And taking advantage of the quote from Satoshi Nakamoto, there are also those who say: "Bitcoin was not supposed to be like that. This is not what Satoshi Nakamoto conceived". Note, I don't know what exactly the individual or group behind the Bitcoin invention conceived. But you see, every human invention encapsulates the knowledge and knowhow of its creator. Encapsulate your ideas. But after "free in the world", invention has a "life of its own", and the ecosystem that was created from the invention has a life of its own. For good and for bad. There is not much more to be said for this.

We are near the end of the opinions I would like to express. One of the last concerns the opinions of politicians, investors, bankers and researchers about the future potential for cryptocurrencies. As I've already expressed, I see no reason to treat cryptocurrencies as an innovation unlike any other technological advance seen in humanity. And so, I am optimistic about the potential of cryptocurrencies, but realistic, far from the detachment from reality of some "moon boys". Now, one of the nuisances driving the perceived value of cryptocurrencies up is good news coming from these industries, which is fair, because it implies progress in adoption. On the other hand, there is the impact of bad news also coming from politicians, investors, bankers and researchers. And it is on this news that I want to do one of our latest mental exercises.

#### 3.1.1 Nível 3

These people, sometimes representatives of large organizations, are ultimately the guardians of the status quo, for better or for worse. The opinions they declare, therefore, never define the true disruptive potential of cryptocurrencies, but rather the position that public opinion is wanted to believe on the subject. What do you expect to hear, for example, in an interview with, for example, an FED director? Do you think it's possible that he'll say something like: "Cryptocurrencies are indeed disruptive, they have enormous potential to transform the current financial system, and it's all a shame, because the organization I represent tends to lose more and more relevance because of it. of that and we will also lose the monopoly of issuing fiat money". Do you really think that a representative of the status quo, public or private, will say something like this?

Representatives of the status quo will always present opinions in defense of the status

quo. It doesn't matter which arguments are used. The arguments will sometimes be good, sometimes bad, but the purpose behind is always to maintain the status quo. Simultaneously with any attempt to maintain the status quo, there are organizations that perceive change as an opportunity to uplift the current status quo, that is, to turn innovation into a competitive differential for themselves. These organizations can be companies or even countries, and in the case of cryptocurrencies, they can see: "Ok, I'm going to dive into cryptocurrencies, because I can make this a competitive advantage for my country."

#### **3.1.1.1 Nivel 4**

It is a natural scenario, inherent to any major transformation in society, markets, form and type of goods and services provided. The point is: bullish news about crypto adoption is indeed bullish news. But you have to be careful with pessimistic news, because deep down, from the beginning, you never expected anything different after all. Organizations that find themselves in a position of dominance of the current status quo, in control of the financial system, will only take positive moves in favor of cryptocurrencies to avoid a "greater evil" from falling behind in relation to other organizations that adopt cryptos as a competitive differential.

And as a last reflection, I invite you to the following reflection: how wrong can all this go? Could it be that all the disruptive potential of cryptocurrencies hasn't already been priced in, and haven't we gone much further? This question is very pertinent. The most pertinent for the cryptocurrency investor after all. The "moon boys" want us to believe that "there are no limits", but in my opinion, there is a limit. Although the adoption of cryptos by society occurs extremely quickly and painlessly, without the need for a "war" against the current status quo, even if the entire world economic system is transformed, there are still limits to the intrinsic and extrinsic value of the sector. Remember the economy is bigger than that.

**3.1.1.1.1 Nivel 5** Judging by the innovations that cryptocurrencies are likely to bring, I believe there is still room for investment in the sector, without it being detached from the real potential of generating value to society. And I believe this because, a lot is said about cryptoCURRENCY, but beyond that, the central point here is not the money, but the transactions. And transactions aren't just economical. Every exchange of information in social dynamics is a transaction. The combination of cryptography with a decentralized consensus protocol undoubtedly finds its greatest utility in the financial system, but it is far from being the last. Ultimately, a decentralized consensus protocol is likely to change the dynamics of the entire internet as we know it today. This is definitely not a small thing, and it is definitely not of little value.

**3.1.1.1.1.1 Nível 6** And taking advantage of the quote from Satoshi Nakamoto, there are also those who say: "Bitcoin was not supposed to be like that. This is not what Satoshi Nakamoto conceived". Note, I don't know what exactly the individual or group behind the Bitcoin invention conceived. But you see, every human invention encapsulates the knowledge and knowhow of its creator. Encapsulate your ideas. But after "free in the world", invention has a "life of its own", and the ecosystem that was created from the invention has a life of its own. For good and for bad. There is not much more to be said for this.

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Quadro 3.1: Um quadro de exemplo

CRITÉRIOS DE INCLUSÃO	CRITÉRIOS DE REJEIÇÃO
(a) Trabalhos com foco no engajamento corporativo com startups	(a) Texto completo indisponível
(b) Trabalhos que falam do tema de CSE, a partir das palavras-chave elencadas	(b) Trabalhos duplicados – será considerada a versão mais recente ou mais completa
(c) Trabalhos de literatura cinza que digam respeito ao tema proposto	(c) Estudos que não falam do tema do engajamento corporativo com startups, a partir das palavras-chave elencadas
(d) Textos disponíveis para consulta e/ou “download” em sua completude	(d) Estudos não apresentados em inglês e/ou português
(e) Documentos acadêmicos e/ou de mercado, que cumpram os critérios (a) ao (d) e possam servir para as análises e discussões	(e) Trabalhos que não atendam às metas de trabalho dessa pesquisa

Fonte: elaborado pelo autor

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Figura 3.1: Uma figura deitado de exemplo

RAZÕES PARA CSE	MODOS DE CSE	ACCELERADORAS [15]	EVENTOS ONE- OFF/DESAFIOS [13]	CORPORATE VENTURE CAPITAL [13]	FUSÕES E AQUISIÇÕES [12]	ESPAÇOS DE COWORKING [11]	PLATAFORMA E PARCERIAS [11]	INCUBADORA CORPORATIVA [11]	INCUBADORA DE NEGÓCIOS [10]	SERVIÇOS DE SUPPORT [9]
Acesso à inovação [21]		[2] Goldstein, Lehmann e Prax, 2015; Bonzom e Netessine, 2016.		[3] Furlani, 2018; Lucerga, 2018; Gutmann, 2018.	[2] Bonzom e Netessine, 2016; Furlani, 2018.			[2] Weiblen e Chesbrough, 2015; Lucerga, 2018.	[1] Bonzom e Netessine, 2016.	
Acesso a novos mercados/clientes/fornecedores (ecossistema de negócios) [18]		[4] Goldstein, Lehmann e Prax, 2015; Arthur D Little, 2016; OpenAxe], 2016; Brigi et al., 2019.	[4] Bonzom e Netessine, 2016; OpenAxe], 2016; Furlani, 2018; Jung, 2018.	[7] Mocker, Bielli e Haley, 2015; Bannerjee, Bielli e Haley, 2015; Bonzom e Netessine, 2016; Sudati, 2016; Furlani, 2018; Mason, Arrington e Mawson, 2019; Brigi et al., 2019.	[6] Mocker, Bielli e Haley, 2015; Bannerjee, Bielli e Haley, 2015; Bonzom e Netessine, 2016; Arthur D Little, 2016; Sudati, 2016; Rundquist e Osterling, 2018.	[2] Bonzom e Netessine, 2016; Kitsuta e Quadros, 2018.	[2] Weiblen e Chesbrough, 2015; 500 Startups, 2016.	[2] Carvalho, 2019; Lucerga, 2018.	[1] Arthur D Little, 2016.	
Agilidade e velocidade [18]		[2] Goldstein, Lehmann e Prax, 2015; Ream e Schatsky, 2016.		[2] Van Peteghem e Mohout, 2018; Gutmann, 2018.	[1] KPMG, 2015.					
Diversificação da cultura de inovação [15]		[5] Goldstein, Lehmann e Prax, 2015; Mocker, Bielli e Haley, 2015; Bannerjee, Bielli e Haley, 2015; Bonzom e Netessine, 2016; Sudati, 2016.	[5] Mocker, Bielli e Haley, 2015; Bannerjee, Bielli e Haley, 2015; Bonzom e Netessine, 2016; Sudati, 2016; Jung, 2018.	[2] Gutmann, 2018; Bagno, Salerno, Souza Junior, 2019.	[2] Bonzom e Netessine, 2016; Arthur D Little, 2016.	[3] Mocker, Bielli e Haley, 2015; Bannerjee, Bielli e Haley, 2015; Bonzom e Netessine, 2016.		[3] Mocker, Bielli e Haley, 2015; Bannerjee, Bielli e Haley, 2015; Sudati, 2016.	[4] Mocker, Bielli e Haley, 2015; Bannerjee, Bielli e Haley, 2015; Bonzom e Netessine, 2016; Sudati, 2016.	[1] Bonzom e Netessine, 2016.
Busca por novos (modelos de) negócios [14]		[2] Goldstein, Lehmann e Prax, 2015; Bonzom e Netessine, 2016.		[5] Bonzom e Netessine, 2016; Gutmann, 2018; Furlani, 2018; Lucerga, 2018; Bagno, Salerno, Souza Junior, 2019.	[1] KPMG, 2015.		[1] OpenAxe], 2016.	[3] Linna, 2017; Richardson, 2018; Kitsuta e Quadros, 2018.		
Busca por conhecimento tecnológico [13]			[2] Sudati, 2016; Jung, 2018.	[1] Vanhaverbeke, Vermeersch e De Zutter, 2012.	[1] Thieme, 2017.	[1] Kitsuta e Quadros, 2018.	[1] Hora et al., 2017.	[1] Rundquist e Osterling, 2018.		
Acesso a novas tecnologias [12]		[4] Bonzom e Netessine, 2016; Arthur D Little, 2016; Ream e Schatsky, 2016; OpenAxe], 2016.	[3] Bonzom e Netessine, 2016; Furlani, 2018; Jung, 2018.	[4] KPMG, 2015; Bonzom e Netessine, 2016; OpenAxe], 2016; Mason, Arrington e Mawson, 2019.	[6] Arthur D Little, 2016; Sudati, 2016; Saalasti, 2016; Thieme, 2017; Furlani, 2018; Rundquist e Osterling, 2018.		[2] 100 Open Startups, 2017; Hora et al., 2017.	[1] Rundquist e Osterling, 2018.	[3] Arthur D Little, 2016; Furlani, 2018; Kitsuta e Quadros, 2018.	
Propensão ao risco [11]		[1] Goldstein, Lehmann e Prax, 2015.		[1] Gutmann, 2018.			[1] 500 Startups, 2016.			
Acesso a novos talentos (reter talentos) [10]		[3] Goldstein, Lehmann e Prax, 2015; Ream e Schatsky, 2016; Brigi et al., 2019.	[2] Bonzom e Netessine, 2016; Furlani, 2018.	[2] KPMG, 2015; Mason, Arrington e Mawson, 2019.	[2] Arthur D Little, 2016; Furlani, 2018.			[1] Carvalho, 2019.		
Soluções com menor tempo e/ou custo [10]			[1] Bonzom e Netessine, 2016.				[1] OpenAxe], 2016.			
Processos burocráticos e pouco flexíveis [8]					[1] Arthur D Little, 2016.			[1] Weiblen e Chesbrough, 2015.		
Ampliação das fontes de receita [7]		[2] Ream e Schatsky, 2016; De la Tour et al., 2017.		[7] Bonzom e Netessine, 2016; Arthur D Little, 2016; Sudati, 2016; OpenAxe], 2016; Thieme, 2017; Lucerga, 2018; Carvalho, 2019.				[1] Furlani, 2018.	[1] Furlani, 2018.	

Fonte: Elaborado pelo autor

And taking advantage of the quote from Satoshi Nakamoto, there are also those who say: "Bitcoin was not supposed to be like that. This is not what Satoshi Nakamoto conceived". Note, I don't know what exactly the individual or group behind the Bitcoin invention conceived. But you see, every human invention encapsulates the knowledge and knowhow of its creator. Encapsulate your ideas. But after "free in the world", invention has a "life of its own", and the ecosystem that was created from the invention has a life of its own. For good and for bad. There is not much more to be said for this.

We are near the end of the opinions I would like to express. One of the last concerns the opinions of politicians, investors, bankers and researchers about the future potential for cryptocurrencies. As I've already expressed, I see no reason to treat cryptocurrencies as an innovation unlike any other technological advance seen in humanity. And so, I am optimistic about the potential of cryptocurrencies, but realistic, far from the detachment from reality of some "moon boys". Now, one of the nuisances driving the perceived value of cryptocurrencies up is good news coming from these industries, which is fair, because it implies progress in adoption. On the other hand, there is the impact of bad news also coming from politicians, investors, bankers and researchers. And it is on this news that I want to do one of our latest mental exercises.

These people, sometimes representatives of large organizations, are ultimately the guardians of the status quo, for better or for worse. The opinions they declare, therefore, never define the true disruptive potential of cryptocurrencies, but rather the position that public opinion is wanted to believe on the subject. What do you expect to hear, for example, in an interview with, for example, an FED director? Do you think it's possible that he'll say something like: "Cryptocurrencies are indeed disruptive, they have enormous potential to transform the current financial system, and it's all a shame, because the organization I represent tends to lose more and more relevance because of it. of that and we will also lose the monopoly of issuing fiat money". Do you really think that a representative of the status quo, public or private, will say something like this? <sup>1</sup>

foo	bar
foo	bar
foo	bar
foo	bar
foo	bar
foo	bar
foo	bar
foo	bar
foo	bar
foo	bar

---

<sup>1</sup> Este é um teste para checar o correto funcionamento das notas de rodapé.

foo	bar
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Tabela 3.1: Your caption here

Representatives of the status quo will always present opinions in defense of the status quo. It doesn't matter which arguments are used. The arguments will sometimes be good, sometimes bad, but the purpose behind is always to maintain the status quo. Simultaneously with any attempt to maintain the status quo, there are organizations that perceive change as an opportunity to uplift the current status quo, that is, to turn innovation into a competitive differential for themselves. These organizations can be companies or even countries, and in the case of cryptocurrencies, they can see: "Ok, I'm going to dive into cryptocurrencies, because I can make this a competitive advantage for my country."

It is a natural scenario, inherent to any major transformation in society, markets, form and type of goods and services provided. The point is: bullish news about crypto adoption is indeed bullish news. But you have to be careful with pessimistic news, because deep down, from the beginning, you never expected anything different after all. Organizations that find themselves in a position of dominance of the current status quo, in control of the financial system, will only take positive moves in favor of cryptocurrencies to avoid a "greater evil" from falling behind in relation to other organizations that adopt cryptos as a competitive differential.

And as a last reflection, I invite you to the following reflection: how wrong can all this go? Could it be that all the disruptive potential of cryptocurrencies hasn't already been priced in, and haven't we gone much further? This question is very pertinent. The most pertinent for the cryptocurrency investor after all. The "moon boys" want us to believe that "there are no limits", but in my opinion, there is a limit. Although the adoption of cryptos by society occurs extremely quickly and painlessly, without the need for a "war" against the current status quo, even if the entire world economic system is transformed, there are still limits to the intrinsic and extrinsic value of the sector. Remember the economy is bigger than that.

Judging by the innovations that cryptocurrencies are likely to bring, I believe there is still room for investment in the sector, without it being detached from the real potential of generating value to society. And I believe this because, a lot is said about cryptoCURRENCY, but beyond that, the central point here is not the money, but the transactions. And transactions aren't just economical. Every exchange of information in social dynamics is a transaction. The combination of cryptography with a decentralized consensus protocol undoubtedly finds its greatest utility in the financial system, but it is far from being the last. Ultimately, a decentralized consensus protocol is likely to change the dynamics of the entire internet as we know it today. This is definitely not a small thing, and it is definitely not of little value.

# Capítulo 4

## Análise

And taking advantage of the quote from Satoshi Nakamoto, there are also those who say: "Bitcoin was not supposed to be like that. This is not what Satoshi Nakamoto conceived". Note, I don't know what exactly the individual or group behind the Bitcoin invention conceived. But you see, every human invention encapsulates the knowledge and knowhow of its creator. Encapsulate your ideas. But after "free in the world", invention has a "life of its own", and the ecosystem that was created from the invention has a life of its own. For good and for bad. There is not much more to be said for this.

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Quadro 4.1: Um quadro de exemplo

cell1	cell2	cell3
cell4	cell5	cell6
cell7	cell8	cell9

Fonte: Elaborado pelo autor

And taking advantage of the quote from Satoshi Nakamoto, there are also those who say: "Bitcoin was not supposed to be like that. This is not what Satoshi Nakamoto concei-

ved". Note, I don't know what exactly the individual or group behind the Bitcoin invention conceived. But you see, every human invention encapsulates the knowledge and knowhow of its creator. Encapsulate your ideas. But after "free in the world", invention has a "life of its own", and the ecosystem that was created from the invention has a life of its own. For good and for bad. There is not much more to be said for this.

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Quadro 4.2: Um quadro de exemplo

cell1	cell2	cell3
cell4	cell5	cell6
cell7	cell8	cell9

Fonte: Elaborado pelo autor



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# **Capítulo 5**

## **Síntese**

# **Capítulo 6**

## **Conclusões**

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# **Apêndice A**

## **Cientometria**

# **Apêndice B**

## **Bibliometria**

# Índice Remissivo

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